Foster Branch Tributary Improvements Monitoring Report

Prepared for:
The Harford County Department of Public Works

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Prepared by:
KCI Technologies Inc.
10 North Park Drive
Hunt Valley, MD
21030

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KCI TECHNOLOGIES

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

Harford County recently completed the construction of a 725-linear foot channel improvement project within an unknown tributary to Foster Branch located in the Foster Branch Watershed. The project area is located in Joppatowne, Maryland in southern Harford County. The project limit extends from Haverhill Road downstream to Foster Knoll Drive (see Figure 1 - Vicinity Map). There appears to be little to no baseflow in the channel, which is fed solely through storm runoff. The majority of the storm runoff enters the channel through a 24" storm drain pipe at the upstream end of the project site. The watershed area to the downstream study point is approximately 16 acres and land use in the watershed is predominantly small, single-family residential lots.

In 1985, the County performed a channel restoration project that included three gabion drop structures, gabion toe protection, and several areas of bank re-vegetation. The channel was recently redesigned and improved because many of the previously repaired areas were unstable and eroding.

This report presents the methods used to monitor the success of the channel improvement project, as well as the results, a discussion, and the conclusions from the Year One post-construction monitoring effort. The report will serve as the baseline conditions report to which subsequent yearly monitoring events will be compared. Reports for the yearly monitoring events that will follow the Year One monitoring will not repeat the introduction and methodologies sections, but instead will consist of Supplements that include only the results, discussion and conclusions sections for those years, which can then be added to this monitoring report.

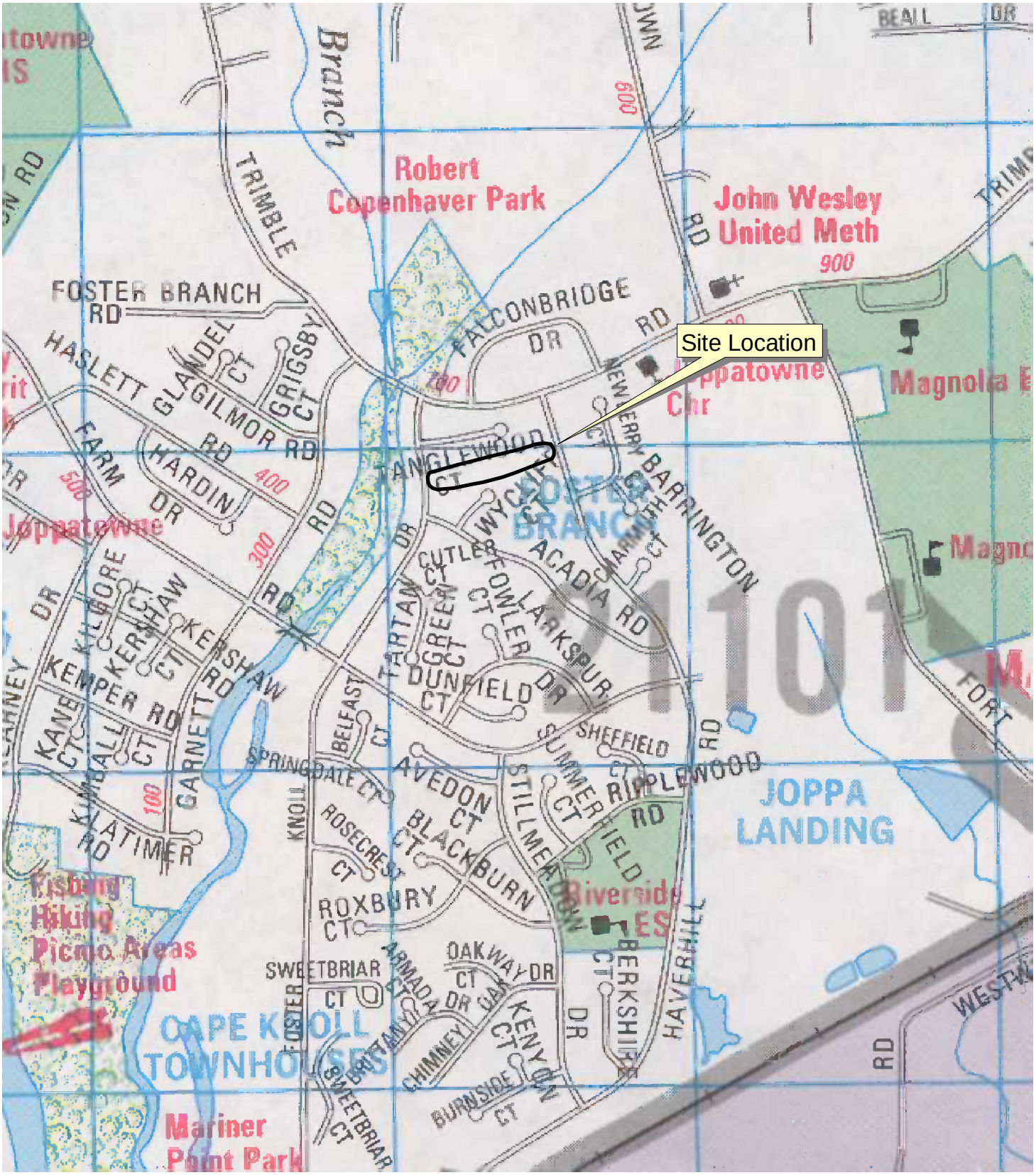
1.1 DESCRIPTION OF CHANNEL IMPROVEMENT EFFORTS

Channel Improvement efforts involved stabilizing the 725-linear foot tributary and included stabilizing both the banks and bed utilizing step pools and a boulder cascade. In addition, the channel was re-graded and the banks were planted with native vegetation.

The work completed at the Foster Branch site was authorized by the United States Army Corps of Engineers under the Maryland State Programmatic General Permit, Category IIIA, Activity 17. The Maryland Department of the Environment (MDE) issued a Water Quality Certification (01-NT-0081/200162506) defining special conditions for the mitigation work required by the ACOE permit. Special conditions related to monitoring are outlined later in this report. Refer to Appendix A for photographs depicting the overall site conditions and restoration applications.

1.2 OVERVIEW OF MONITORING ACTIVITIES

Monitoring protocols for the Foster Branch Tributary site were developed in order to evaluate the success and stability of the restored channel. These protocols involve fluvial geomorphologic assessments, inspections of installed channel stabilization techniques, and vegetative stabilization inspections, which are performed annually during baseflow stream conditions (i.e., non-storm event conditions). The monitoring program, as detailed briefly below and in greater detail in the methodologies section, is conducted on an annual basis for a minimum 3-year monitoring period, beginning in 2004. Following the conclusion of this monitoring period, the County will determine if additional monitoring or any remediation efforts will be needed.



Foster Branch Tributary Restoration
Site Vicinity Map

N

Not to Scale

Harford County, Maryland
ADC Map 28, C-6
ADC of Alexandria, 2000

Fluvial geomorphologic monitoring is conducted in order to evaluate the bed and bank stability. Four monumented channel cross-sections were established during baseline monitoring at various critical locations along the improved tributary. Each section is measured annually during baseflow/non-stormflow conditions to evaluate channel stability. Topographic survey of the entire channel reach was completed during baseline monitoring for comparison to as-built and/or final design plans in order to assess changes to the channel and floodplain. Subsequent annual monitoring events do not include completion of a full topographic survey of the channel. However, during the topographic survey, a profile was surveyed to delineate the bed features along the thalweg or low flow line of the channel, and a channel profile survey to track changes in slope and bed features is conducted annually. Pebble counts are conducted at three riffles and one pool annually. Bed and bank pins installed during baseline monitoring conditions are also monitored annually to assess general bank stability.

Cursory inspections are conducted annually for each of the installed channel stabilization techniques, including both in-stream structures and non-vegetative bank stabilization techniques. Vegetation inspections are also conducted annually and include a cursory assessment of the success of the installed bioengineering materials (live stakes) and other riparian vegetation, as well as an assessment of volunteer species that are becoming established.

Because the results section of this report covers the Year One baseline conditions monitoring effort, a brief explanation is provided comparing the intended design features to the post-construction monitoring results.

1.3 GOALS AND OBJECTIVES

As detailed above, the project was authorized by the United States Army Corps of Engineers under the Maryland State Programmatic General Permit, Category IIIA, Activity 17, and by the permit requirements and conditions within Maryland Department of the Environment permit Number 01-NT-0081/200162506. These conditions require the County to monitor the site for three years to determine the success of the project.

As a goal of the project, Harford County expects improved stability throughout the reach and decreased bed and bank erosion. In addition, the County anticipates that the stabilization will help protect adjacent property by controlling lateral migration of the channel.

2.0 METHODOLOGIES

2.1 FLUVIAL GEOMORPHIC ASSESSMENT MATERIALS AND METHODS

The fluvial geomorphic assessment is conducted to quantify basic stream characteristics including bed and bank stability as well as riffle/pool sequences. Full topographic survey of the channel reach, and cross-sectional and longitudinal profile surveys are completed to establish baseline conditions, compare the Year One post-construction monitoring results to the proposed design plans developed by KCI Technologies, Inc., and ultimately to compare any changes in channel geometry and slope that occurs over subsequent annual monitoring events. Pebble counts are performed to characterize channel substrate and to estimate channel roughness. Bank and bed pins are monitored to determine rates of potential bank and channel bed erosion or aggradation. Detailed methods are described below.

2.1.1 Topographic, Longitudinal Profile and Cross-sectional Surveys

Full topographic survey of the project site was completed during the Year One monitoring effort to develop mapping of the baseline post-construction conditions. Features picked up during this survey include elevation shots to develop contours at one-foot intervals, elevations along the field identified location of the centerline of flow or thalweg of the stream and the locations of installed in-stream structures, and pool/bar formations. A longitudinal profile of the stream was developed for the baseline conditions based on the thalweg survey.

This topographic survey serves as the baseline field conditions for comparison during annual post-construction monitoring efforts. The plotted longitudinal profile also serves as the baseline for comparison during subsequent years and is used to track changes that occur in the bed structure sequences. Because digital files of the profile data are available to KCI, direct comparisons between the 2004 profile surveys and the baseline condition surveys are also included in this analysis and in the Year One monitoring report. It should be noted that stationing along the channel thalweg, as surveyed by KCI in 2004, differs slightly from stationing on the proposed design drawings due to differences in starting points.

In order to establish locations where fluvial geomorphic characteristics of the channel could be measured and compared from one year to the next to assess bed and bank stability, permanent cross-sections were established at four (4) locations along the channel; two along riffles and two along pools. Each cross-section was monumented on both sides of the channel with a carriage bolt set into concrete in a PVC pipe cast. The monument locations and elevations were surveyed and added to the topographic base mapping. Cross-sections are field surveyed annually at each of the following stations using a laser level, calibrated stadia rod, and measuring tape.

Section 1 - Station 1+50	Section 3 - Station 5+45
Section 2 - Station 2+20	Section 4 - Station 6+22

Surveyed cross-sections are plotted and each of the annual monitoring years are overlain and compared to the baseline condition cross-sectional measurements. The focus of these evaluations is on bankfull width, mean depth, width/depth ratios, and overall bank stability.

Because bankfull elevations were not evident in the field, especially in areas where riprap was placed over the entire bank, elevations to generate hydraulic geometry values were selected based upon top of bank design features. These set elevations, determined at each cross section listed above, will be utilized during future monitoring events to generate hydraulic geometry values that are directly comparable between each monitoring event.

2.1.2 Wolman Pebble Counts

Channel substrate composition is an important aspect of a stream's geomorphic character. Sediment size provides insight into channel roughness and flow determination using incipient motion analysis such as the Shields Diagram. Generally, the most efficient method to determine sediment size of the channel bed and banks is the Wolman pebble count (Leopold et al., 1964).

The pebble count procedure used for this post-construction monitoring effort was adapted from *Stream Channel Reference Sites: An Illustrated Guide to Field Technique* (Harrelson et al, 1994). Four sites were chosen for sampling and analysis: three are located in riffles and the final count is situated within a pool. A minimum of 100-particles is obtained to ensure a valid count. Particles

are then tallied using Wentworth size classes, in which the size doubles with each class (<2, 2, 4, 8, 16, 32, etc.). Sampling at transects begins at a randomly selected point. The intermediate axis (neither the longest nor shortest of three mutually perpendicular sides) of each collected particle is measured. Embedded particles or those too large to be moved in place are measured at the smaller of the two exposed axes. The sampler moves upstream or downstream randomly to take a sample total of at least 100 particles. After counts and tallies are completed, the data is plotted by size class and frequency on log-normal paper.

2.1.3 General Bank & Bed Stability (Bank Pins and Bed Pins)

To monitor channel adjustments, KCI installed bank and bed (toe) pins within two of the three permanent riffle cross-section locations. Three-foot pins consisting of rebar were hammered into the top and toe of the bank until approximately one-inch was exposed above the surface. Following installation, the offsets for each bank and bed pin were measured, beginning from the right monument (looking upstream/up-station along the survey baseline) at each of these cross-sections. Locations and offsets for the pins are listed below:

Station 1+50
Offsets 0+04 - Right Mid-Bank
0+18.8 - Bed
0+27.1 - Bed
0+36.2 - Left Top-Bank

Station 5+45 - Riffle
Offsets 0+08 - Right Top-Bank
0+23.9 - Bed
0+31.1 - Bed
0+40 - Left Top-Bank

The exposed length of each pin was measured during Year One monitoring efforts then pins are surveyed annually to assess bed and bank erosion. This information is useful in determining if installed stream features or other circumstances occurring within the improved channel or its watershed are resulting in any new channel degradation, bank erosion or channel accretion.

2.2 CHANNEL STABILIZATION TECHNIQUE INSPECTIONS

A cursory visual assessment is conducted for each of the installed channel stabilization techniques, including both in-stream structures (step pools and gabions) and non-vegetative bank stabilization techniques (riprap). Evidence of movement within the structure, excessive scour, undercutting, erosion, or other type of failure of the technique is photographed and notes are recorded as to the degree and extent of the problem. No formal measurements of these structures/techniques are conducted following the baseline condition monitoring.

2.3 VEGETATIVE STABILIZATION TECHNIQUE INSPECTIONS

Informal visual inspections are conducted to generally assess the establishment and survivability of vegetative stabilization techniques along each 50-foot length of the stream channel. The first item evaluated is the overall percentage of areal vegetative cover (i.e., both installed materials and volunteer species) that has become established and is providing functionality along the banks. Functionality is defined as evidence of root growth that is maintaining the integrity of the stream

bank. Areas where vegetative establishment within the project limits is sparse or non-existent are areas that may become prone to erosion. These areas are evidenced from a lowering of this percentage.

The second item assessed is the percentage of plant survivability of both the installed vegetative stabilization techniques (i.e., live stakes, riparian plantings, and permanent seed) and any volunteer species establishing within the above areal coverage. Survivability is defined as evidence of growth leading to the development of healthy leaves and roots. Because the exact locations of the installed plant materials were not surveyed in as part of the as-built plans, have not been marked/flagged, and are not always easily discernible in the field, formal determinations regarding plant survivability of only the installed vegetation have not been performed.

During the above inspections, the general health or any other apparent issues concerning the vegetation is noted. Areas where vegetative stabilization of the banks is failing significantly or the vegetation is showing signs of stress, disease, pest/predation problems, or poor survivability are also noted and their approximate location is recorded. The presence, location and extent of any invasive species becoming established that could potentially displace native plantings are also recorded.

3.0 MONITORING YEAR 1: RESULTS AND DISCUSSION

3.1 FLUVIAL GEOMORPHIC ASSESSMENT

3.1.1 Topographic, Longitudinal Profile, and Cross-sectional Surveys

The topographic survey of the project study area was completed by KCI in September 2004. The mapping developed from this survey serves as baseline post-construction condition mapping to compare field conditions measured and inspected during future annual monitoring events. As mentioned above, the locations of the installed and existing in-stream structures (step pools, gabions, etc.,) were surveyed and included on the base mapping, as were the locations of significant pools and bar features. (Refer to Appendix B for baseline condition topographic mapping)

The planform of the topographic survey conducted by KCI is generally consistent with the planform shown on the proposed design drawings developed by KCI in 2002. However, the longitudinal profile data is significantly different. When comparing the 2002 proposed design drawings to the 2004 survey data, as illustrated in Appendix C, results indicate a nearly three-foot discrepancy over a significant portion of the channel improvement project length. Note that two longitudinal profiles are shown in Appendix C to better compare the proposed design and post-construction profiles. Because the exact original baseline could not be duplicated when surveying the as-built conditions, a profile was generated using the digital terrain model (DTM) developed for the 2004 topographic data to represent elevations associated with the location of the baseline used in the original design. The lower profile was generated from field-collected survey points along the post-construction thalweg as determined by the field survey crew during the Year One monitoring activities.

As shown in Appendix C, the 2004 survey data indicates that the channel, from stations 1+75 to 5+50, is approximately three feet higher than the proposed design. This discrepancy could lead to localized velocity and erosion problems. Typically, discrepancies of this magnitude may indicate errors during construction, such as grading of the subgrade to final grade elevations and then placing stone over the final grade. Whether or not this occurred at the site could not be

determined at the time of this report submittal. However, further investigations will be conducted during year two monitoring.

In addition to the longitudinal profile analysis above, the proposed design and monitored slope data were compared. The slope was determined by subtracting the elevation at the top of a riffle at the downstream extent of the project from the elevation at the top of a riffle at the upstream end of the project, then dividing this number by the total length of the channel between these two points, as measured along the thalweg of the stream. The measured slope, as indicated in Table 3-1, will be compared to subsequent annual monitoring data to track potential changes in the overall channel bed slope. In addition, the surveyed profile during these annual events will be plotted, overlain and compared to the baseline condition profile (Appendix C) in order to assess changes occurring in the bed structure.

Even though the longitudinal profile indicates a substantial deviation in design elevations as previously discussed above, data indicate that the overall channel slope calculated from as-built survey data and design data are similar. Localized discrepancies are apparent in areas where elevations should have tied in at a lower grade in accordance with the proposed design.

Table 3-1 Channel Bed Slopes

Event	Bed Slope
Designed	7.12%
Monitored 2004	7.17%

As described above, cross-sectional surveys were analyzed at each of the four permanent monitoring locations to determine bankfull width, mean depth, the width/depth ratio, and overall cross-sectional area during baseline conditions. Results of the cross-sectional measurements are included in Table 3-2 and graphical depictions of each section are presented in Appendix D.

Table 3-2 Results of Cross-sectional Survey Analysis

Date Performed	Bankfull Width (ft)	Mean Depth (ft)	Width/ Depth Ratio	Cross-sectional Area (ft^2)
Station 1+50 Riffle				
August 20, 2004	11.17	1.16	9.63	13.0
Station 2+20 Pool				
August 20, 2004	8.64	1.44	8.61	12.4
Station 5+45 Riffle				
August 20, 2004	9.89	1.26	7.85	12.5
Station 6+22 Pool				
August 20, 2004	12.59	1.22	10.32	15.3

Because the cross sections listed above were not situated in the exact same location as those used for the proposed design, individual cross-sections were generated from the 2004 topographic survey data and compared to the proposed design sections (Appendix D). When comparing the

computer-generated as-built cross-sections to the proposed design data, results indicate that current field elevations are approximately one to three feet higher than proposed. In addition, the constructed channel appears to be more confined at its base. This assessment reinforces the previously generated conclusion that the channel may not have been graded to the appropriate elevations prior to the placement of the final grade materials.

3.1.2 Wolman Pebble Counts

The results of the pebble count data collected during the Year One monitoring effort indicate that the increased slope in localized areas may be influencing the particle sizes being deposited in the riffles and pools. The average for the D_{50} for riffles ranged from very fine to coarse gravels and the D_{84} was in the coarse gravel to very coarse gravels range. In addition to the three riffle locations, the pool at station 2+00 was selected for sampling to track sediment deposition and pool formation at the lower end of the steeply sloped restored reach. For the most part, the bed material in this location consists of the granite/schist used at the time of construction, with smaller particle deposition.

Because the pool is located at the end of a steeply sloped reach it is likely that, smaller particles, including ones similar, or slightly larger, in size to those found in riffle locations, will be flushed through the step-pool reaches, resulting in a pool lacking deposition of fine/gravel sediment. Fluctuations are expected to occur in particle size throughout each monitoring period, and these fluctuations would likely be the result of the different sediment transport capabilities of the various types of flow events that occur over a particular period in time. These natural fluctuations do not necessarily indicate imbalances in the stream. Particle size distribution charts are included in Appendix E. The resulting values are included in Table 3-3 below.

Table 3-3 Result of Particle Size Analysis- Riffles/Pools

Station Identity	Mean Particle Size (mm)	
	D_{50}	D_{84}
0+30 Riffle-September 2004	21.6	39.0
1+50 Riffle-September 2004	9.6	34.7
5+45 Riffle-September 2004	3.8	23.2
Average Riffle-September 2004	**11.7**	**32.3**
2+00 Pool September 2004	41.0	52.3
Average Pool-September 2004	**41.0**	**52.3**

3.1.3 General Bank and Bed Stability

During the baseline condition monitoring, bed and bank pins were established and the exposed length of each pin was measured. The bank and toe pins will be surveyed each year and compared to the baseline and previous years data. The exposed lengths of each pin are summarized in Tables 3-4 and 3-5.

Table 3-4 Bank and Bed Pin Locations - Station 1+50

Location Along Section	Bank/ Toe Pin	Elevation of Pin (Level of Exposure/Deposition) Feet (feet)
		9/2/04
0+04	Bank	-0.07
0+18.8	Bed	-0.10
0+27.1	Bed	-0.08
0+36.2	Bank	-0.10

Table 3-5 Bank and Bed Pin Locations - Station 5+45

Location Along Section	Bank/ Toe Pin	Elevation of Pin (Level of Exposure/Deposition) Feet (feet)
		9/2/04
0+08	Bank	-0.28
0+23.9	Bed	-0.15
0+31.1	Bed	-0.10
0+40	Bank	-0.12

Because this is the first post-construction assessment, no data comparison is included in this report. Subsequent monitoring data will be compared to these baseline conditions to evaluate erosion and depositional trends associated with the channel improvement project. Negative values for the measurements indicate the length of pin exposed, while positive values indicate the amount of deposition on top of the pin.

3.2 CHANNEL STABILIZATION TECHNIQUES

Channel stabilization techniques were inspected throughout the improved channel reach in September and also in early November 2004, following receipt of the full topographic survey. The topographic survey included the locations of visible portions of the ins-stream structures, including step pools, riprap lined channel, and existing gabion baskets. KCI's Environmental Scientists walked the channel to confirm the location of each structure and to assess their functionality. The approximate locations of each structure and a description of their functionality, as assessed during the Year One monitoring efforts, is included in Table 3-6 below.

Table 3-6 Channel Stabilization Structures – September & November 2004

Station	Structure Type	Comments
1+80	Gabion	Not removed during reconstruction. Structure stable and providing grade control.
1+85 to 4+80	Riprap Lined Channel	Riprap lining providing bed and bank stabilization.
1+90 to 2+10	Step Pool System	Structure stable. Providing grade control.

Station	Structure Type	Comments
2+12 to 2+30	Step Pool System	Structure stable. Providing grade control.
2+40 to 2+48	Step Pool System	Structure stable. Providing grade control.
5+57	Gabion	Not removed during reconstruction. Structure stable and providing grade control.
5+90 to 6+40	Step Pool System	Structure stable. Providing grade control.
6+45 to 6+91	Riprap Lined Channel	Not removed during reconstruction. Riprap lining providing bed and bank stabilization.

As indicated in the above table, the structures installed/stabilized during the reconstruction of the project are providing bed and bank stabilization as designed. No major erosion or instability within the vicinity of the structures was documented during the site walks.

3.3 VEGETATIVE STABILIZATION TECHNIQUES

Vegetative stabilization techniques were inspected along 50 linear foot lengths of the restored channel reach in September 2004. Data collected for the Year One baseline condition monitoring efforts is listed in Tables 3-7 and 3-8 below. Relevant comments regarding the vegetation establishment and survivability are also included in the tables and additional information assessed concerning the overall health of the vegetation, or any other evident problems within the reach are described in the discussion below.

Table 3-7 Vegetation Evaluation, Right Bank – September 2004

Right Bank Station	Percent Areal Vegetation Coverage on Banks	Percent Survivability of Vegetative Cover	Comments
0+00 to 0+25	75	100	Thick canopy above-sparse vegetation on ground
0+25 to 0+75	20	100	Thick canopy above-sparse vegetation on ground
0+75 to 1+25	10	100	Thick canopy above-sparse vegetation on ground
1+25to 1+75	75	100	Thick canopy above-sparse vegetation on ground
1+75 to 2+25	90	100	Live stakes healthy
2+25 to 2+75	75	100	Moderate canopy coverage above
2+75 to 3+25	75	100	Moderate canopy coverage above
3+25 to 3+75	50	100	Steep bank-sparse vegetation
3+75 to 4+25	95	100	
4+25 to 4+75	90	100	
4+75 to 5+25	50	90	4 live stakes apparently dead/minimal growth
5+25 to 5+75	20	100	
5+75 to 6+25	45	100	Exposed bank/leaf debris-no vegetation
6+25 to 6+75	100	95	Japanese stiltgrass/ 2 live stakes apparently dead
6+75 to 7+25	100	100	
Averages	**65%**	**99%**	

Table 3-8 Vegetation Evaluation, Left Bank – September 2004

Left Bank Station	Percent Areal Vegetation Coverage on Banks	Percent Survivability of Vegetative Cover	Comments
0+00 to 0+25	95	100	Herbaceous coverage, including English ivy
0+25 to 0+75	20	100	Thick canopy above-sparse vegetation on ground
0+75 to 1+25	20	85	Thick canopy above-sparse vegetation on ground
1+25to 1+75	85	100	Thick canopy above-sparse vegetation on ground
1+75 to 2+25	85	100	Minimal growth on live stakes
2+25 to 2+75	85	80	8 live stakes dead/minimal growth
2+75 to 3+25	100	100	
3+25 to 3+75	100	100	95% Japanese stiltgrass
3+75 to 4+25	90	100	Japanese stiltgrass and other grasses
4+25 to 4+75	100	100	Japanese stiltgrass and other grasses
4+75 to 5+25	100	100	Japanese stiltgrass and other grasses
5+25 to 5+75	95	100	Bank Erosion/Japanese stiltgrass
5+75 to 6+25	95	100	
6+25 to 6+75	95	95	Good live stake growth/but 3 minimal to no growth
6+75 to 7+25	100	100	
Averages	**84%**	**97%**	

Based on the vegetation viability data, approximately 65% to 84% of the channel banks in the restored reaches have a well-established vegetative community. The percentage of coverage on the right bank is somewhat low and is most likely due to seasonal growth patterns, shading, slope aspect, and landowner influences. Overall, the vegetation present is healthy. Generally, the live stakes appear to be in good condition except from stations 4+75 to 5+25 and 6+25 to 7+25 on the right bank and from stations 2+25 to 2+75 and 6+25 to 6+75 on the left bank. Even though the live stakes are not fully established in these locations, other herbaceous vegetation has emerged and appears to be stabilizing the banks.

Minor erosion is occurring between stations 0+60 to 1+90 on both the right and left banks. The downstream reach appears to be relatively shaded and vegetation (other than English ivy) occurring between stations 0+60 and 1+90, is scarce throughout these areas. Based on visual observations, the banks near cross-section one (station 1+50) have the greatest potential for significant erosion. Younger understory species are developing in this area and will provide additional bank stabilization over time. In addition, yard debris is preventing herbaceous vegetation from establishing in this area.

Adjacent landowners have also dumped yard waste near stations 5+50 to 5+65 on both the right and left banks, causing the vegetation to die back. Likewise, near cross-section three, yard waste is being dumped on the right bank resulting in vegetation die off. In addition, the left bank seems to be slumping due to the lack of vegetation. Further monitoring will be conducted over the next several years to track vegetation stabilization and to determine any remediation requirements.

4.0 CONCLUSION

The Harford County Department of Public Works, Water Resources Engineering Division requested KCI to perform stream monitoring to fulfill permitting conditions associated with the construction of the 725 linear-foot Foster Branch channel improvement project, located within the

Foster Branch watershed. As detailed in the Maryland State Programmatic General Permit, and Maryland Department of the Environment (MDE) Water Quality Certification, approved mitigation efforts included the construction of step pools, a boulder cascade, and grading and revegetating the banks.

To adequately assess the success of the project, a monitoring plan was developed that involves fluvial geomorphic, structure stability, and vegetation monitoring. To date, the fluvial geomorphic monitoring results suggest that the bed and banks, for the most part are stable. However, as detailed in Section 3, minor erosion is occurring along the banks in some areas where vegetation is not well established. These areas will be tracked during future monitoring events to determine if remediation will be required.

Based on visual field observations, all installed structures are functioning in accordance with their associated design goals and objectives, and are providing bank protection and grade control. However, as shown in Appendix C, the 2004 survey data indicate that the channel, from stations 1+75 to 5+50, is approximately three feet higher than the proposed design. This discrepancy could lead to increased localized velocities and potential down-stream erosion problems. Monitoring will continue to track any potential problems associated with this discrepancy.

In general, the banks appear to be stable and well vegetated although there are a few minor areas where vegetative establishment and/or plant survivability is less than optimal. The percentage of coverage on the right bank is somewhat low and is most likely due to seasonal growth patterns, shading, slope aspect, and landowner influences, such as the dumping of yard waste. Overall, the vegetation present is healthy.

Based on the Year One monitoring efforts, it appears that the goals of the project, including bed and bank stability are being achieved. Installed structures are providing bed and bank stabilization and vegetation, for the most part, is becoming established and is healthy.

Because this is the first year of post-construction monitoring, conditions could change based on vegetation growth, sediment transport, and overall bank stability, as well as potential major flooding or catastrophic events. Subsequent monitoring will occur over a minimum of the next two years to track the stability of the restored stream and any changes that occur within the channel. Post-construction monitoring reports for subsequent monitoring years will be prepared and submitted yearly at the end of each year. The reports will only include the data collected, results and discussion section that compare the yearly results to the baseline information and previous years monitoring events, and a conclusions section summarizing whether or not the stream restoration project is continuing to meet the project goals.

5.0 REFERENCES

Harrelson, C.C., Rawlins, C.L. and J.P. Potyondy. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique*. *General Technical Report RM-245*. United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

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Wolman, M.G. 1954. *A Method of Sampling Coarse River-Bed Material.* Transactions of the American Geophysical Union, 35: 951-956.

APPENDIX A

SITE PHOTOGRAPHS

Photo 1 – Existing bank conditions, downstream near Foster Knoll Drive, facing upstream, September 2004

Photo 2 – Existing bank conditions, downstream near Foster Knoll Drive, facing upstream, September 2004

Photo 3 – Existing bank conditions, downstream near Foster Knoll Drive, facing upstream, September 2004

Photo 4 – Station 1+50, facing upstream, September 2004

Photo 5 – Station 1+50, facing downstream, September 2004

Photo 6 – Station 2+20, facing upstream, September 2004

Photo 7 – Station 2+20, facing downstream, September 2004

Photo 8 – Station 5+45, facing upstream, September 2004

Photo 9 – Station 5+45, facing downstream, September 2004

Photo 10 - Station 5+50 to 5+65, slumped left bank, facing downstream, September 2004

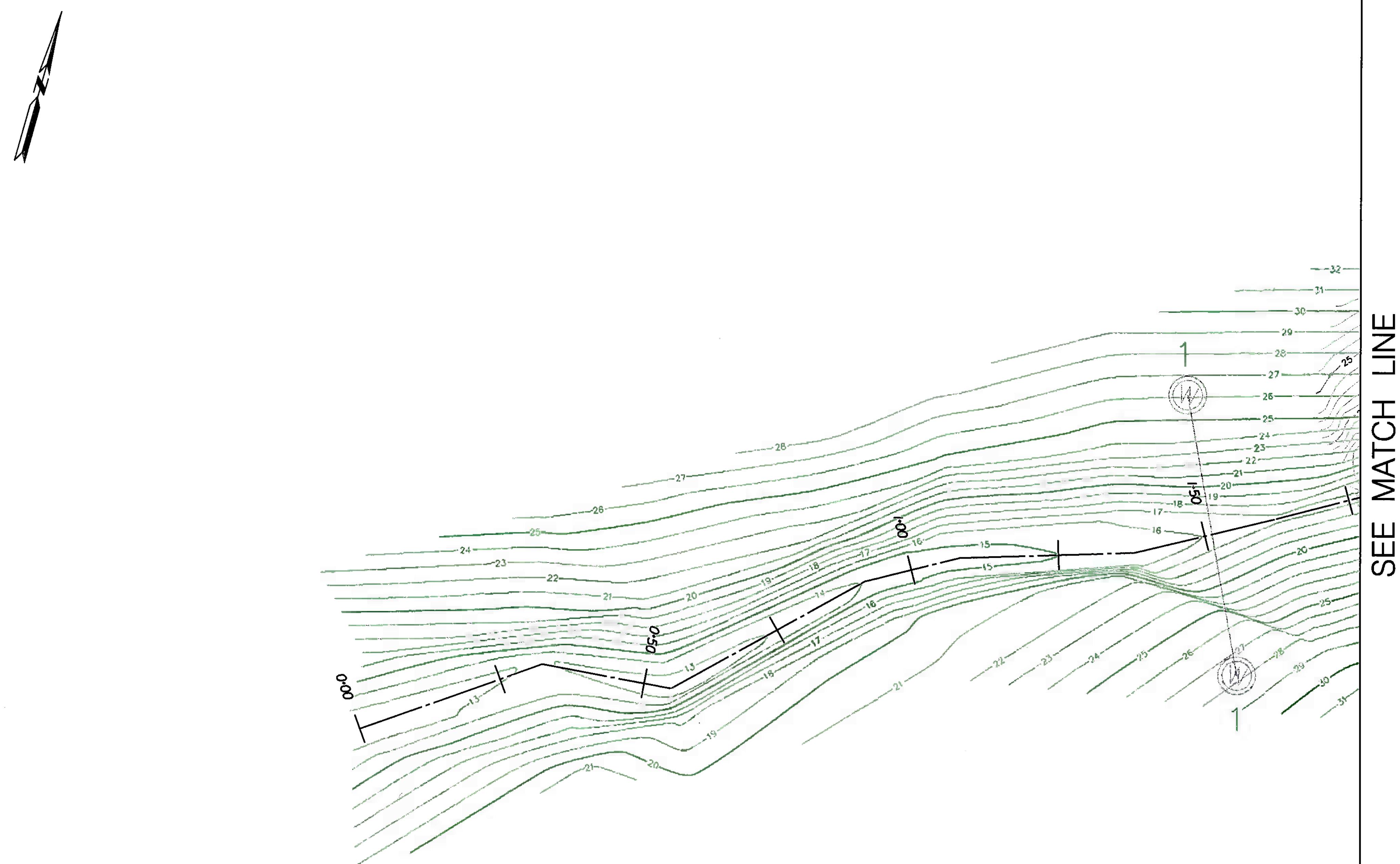
Photo 11 - Station 5+50 to 5+65, un-vegetated bank, facing downstream, due to yard debris/waste, September 2004

Photo 12 – Station 6+22, facing upstream, September 2004

Photo 13 - Station 6+22, facing downstream, September 2004

APPENDIX B

BASELINE CONDITION TOPOGRAPHIC MAPPING



LEGEND

AS-BUILT CONTOURS	
PROPOSED CONTOURS	

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE	REVISION	BY

DRAWING COMPLETED

HARFORD COUNTY MARYLAND

HARFORD COUNTY DIRECTOR OF PUBLIC WORKS ____ Date ____

HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING ____ Date ____

DEPARTMENT OF PUBLIC WORKS WATER RESOURCES ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE
POST - CONSTRUCTION SURVEY

KCI TECHNOLOGIES — Engineers, Planners, Scientists, Construction Managers — 10 North Park Drive, Hunt Valley, MD 21030 — Phone (410) 316-7800 — Fax (410) 316-7817 — www.kci.com

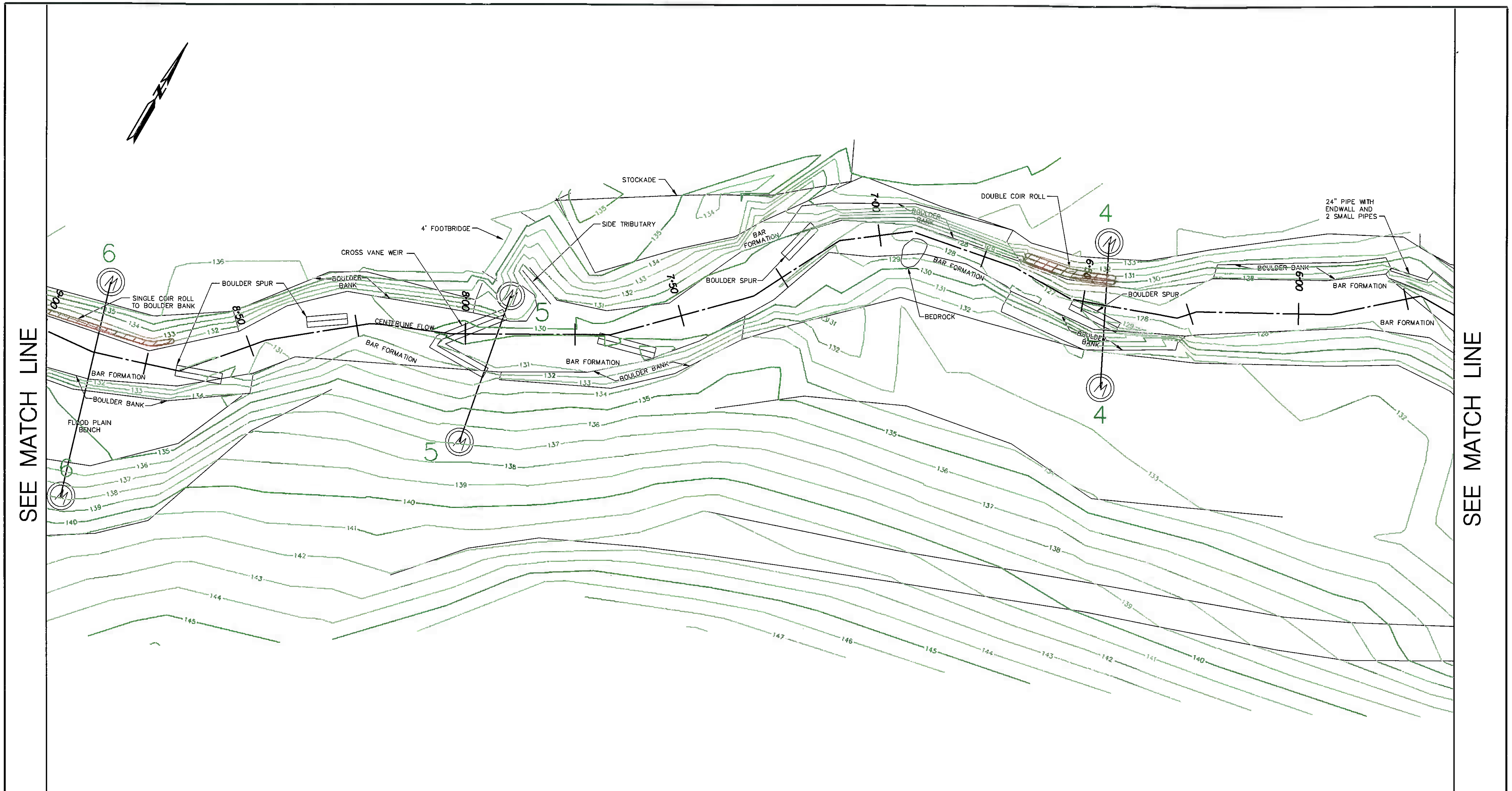
DESIGNED
TRACED
CHECKED

SCALE NTS APPROX. SCALE 1" = 20'

TAX MAP: POSITION SHEET

SHEET NO. ____ OF ____

J.O. ____
FILES ____



LEGEND

CONTOURS

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

ENGINEER'S SEAL

DATE	REVISION	BY

DRAWING COMPLETED

HARFORD COUNTY MARYLAND

HARFORD COUNTY DIRECTOR OF PUBLIC WORKS ______ Date ______

HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING ______ Date ______

DEPARTMENT OF PUBLIC WORKS WATER RESOURCES ENGINEERING

BOXHILL TRIBUTARY BASELINE

POST - CONSTRUCTION SURVEY

KCI TECHNOLOGIES
Engineers Planners Scientists Construction Managers
10 North Park Drive Hunt Valley, MD 21030
Phone: (410) 316-7800 Fax: (410) 316-7817
www.kci.com

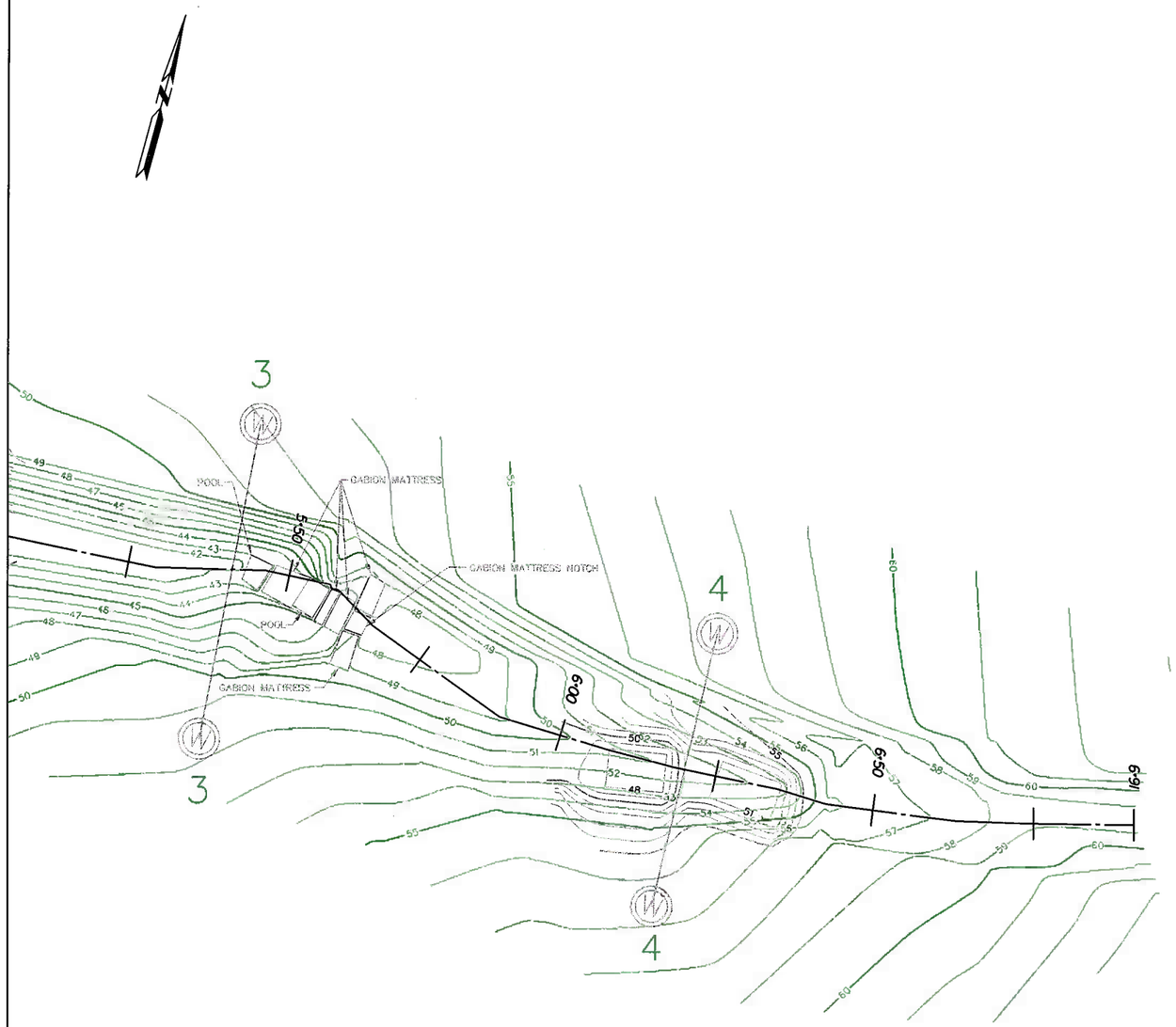
DESIGNED ______

TRACED ______

CHECKED ______

SCALE NTS APPROX. SCALE 1" = 20'	TAX MAP	SHEET	J.O. ______
	POSITION SHEET	NO. ______ OF ______	FILES ______

SEE MATCH LINE



LEGEND

AS-BUILT CONTOURS

PROPOSED CONTOURS

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE	REVISION	BY

DRAWING COMPLETED

HARFORD COUNTY
MARYLAND

HARFORD COUNTY
DIRECTOR OF PUBLIC WORKS
Date

HARFORD COUNTY
DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING
Date

DEPARTMENT OF PUBLIC WORKS
WATER RESOURCES
ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE
POST - CONSTRUCTION SURVEY

KCI TECHNOLOGIES

DESIGNED
TRACED
CHECKED

SCALE
NTS
APPROX. SCALE
1" = 20'

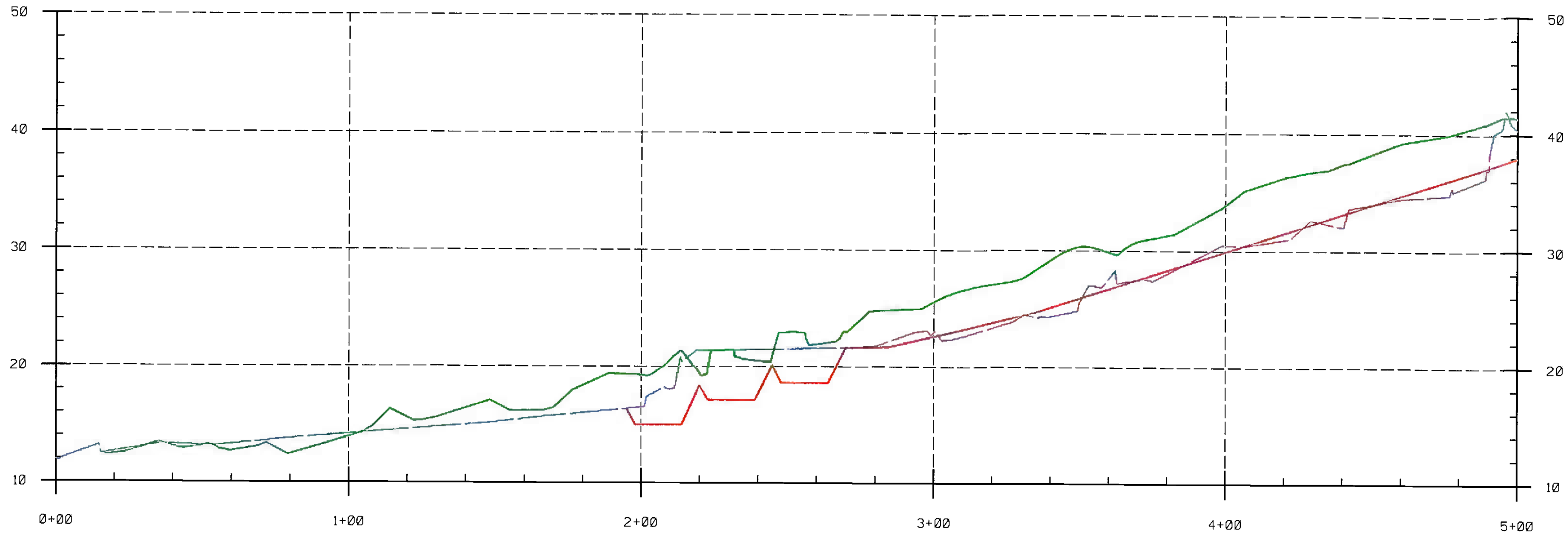
TAX MAP
POSITION SHEET

SHEET
NO.
OF

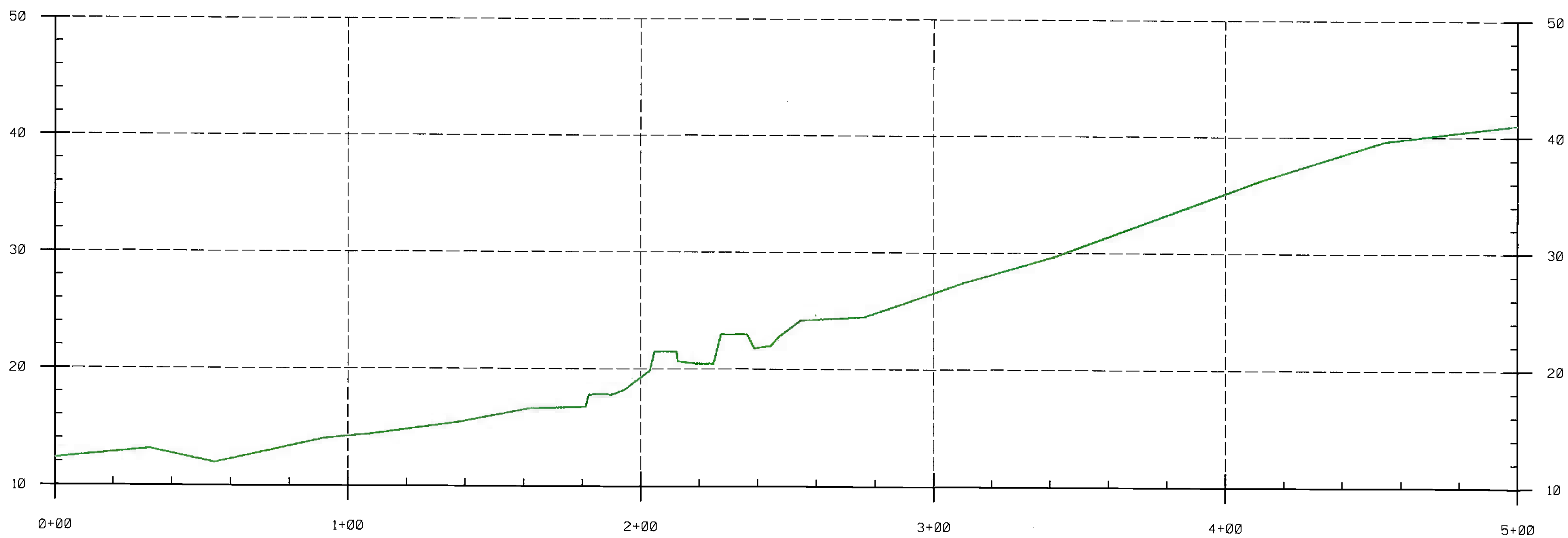
J.O.
FILES

APPENDIX C

LONGITUDINAL PROFILE SURVEY DATA



PROFILE OF CONSTRUCTION BASELINE BASED ON DIGITAL TERRAIN MODEL



PROFILE OF THALWEG BASED ON YEAR ONE FIELD SURVEY

LEGEND

- AS–BUILT GRADE
- ORIGINAL EXISTING GROUND
- DESIGN GRADE

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

ENGINEER'S SEAL

DATE	REVISION	BY

DRAWING COMPLETED____

HARFORD COUNTY
MARYLAND

HARFORD COUNTY
DIRECTOR OF PUBLIC WORKS
____Date____

HARFORD COUNTY
DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING
____Date____

DEPARTMENT OF PUBLIC WORKS
WATER RESOURCES
ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE
POST – CONSTRUCTION PROFILE

KCI TECHNOLOGIES
Engineers
Planners
Scientists
Construction Managers
10 North Park Drive
Hunt Valley, MD 21030
Phone (410) 316-7800
Fax (410) 316-7817
www.kci.com

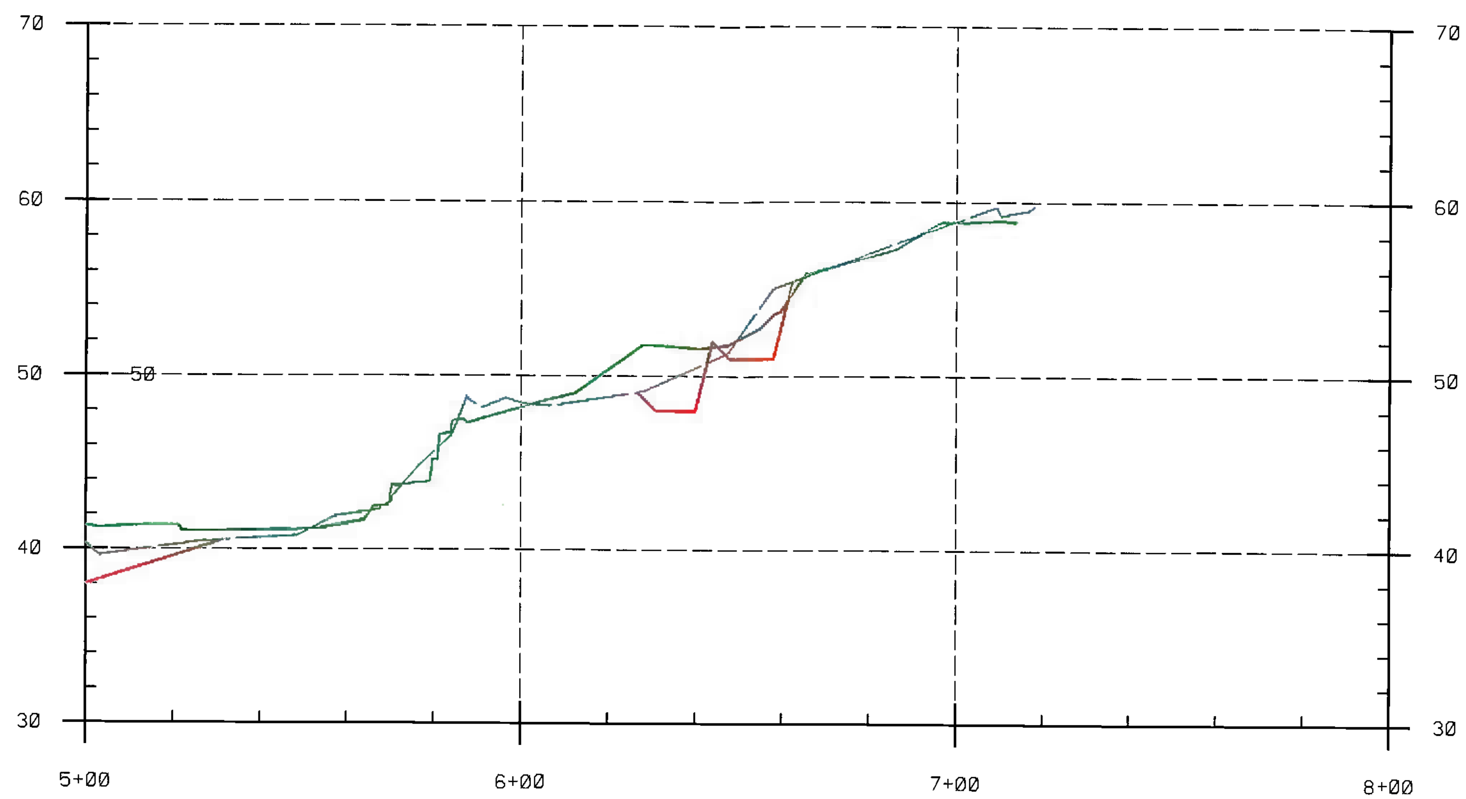
DESIGNED
TRACED
CHECKED

SCALE
NTS
APPROX. SCALE
HOR. 1"=40'
VERT. 1"=10'

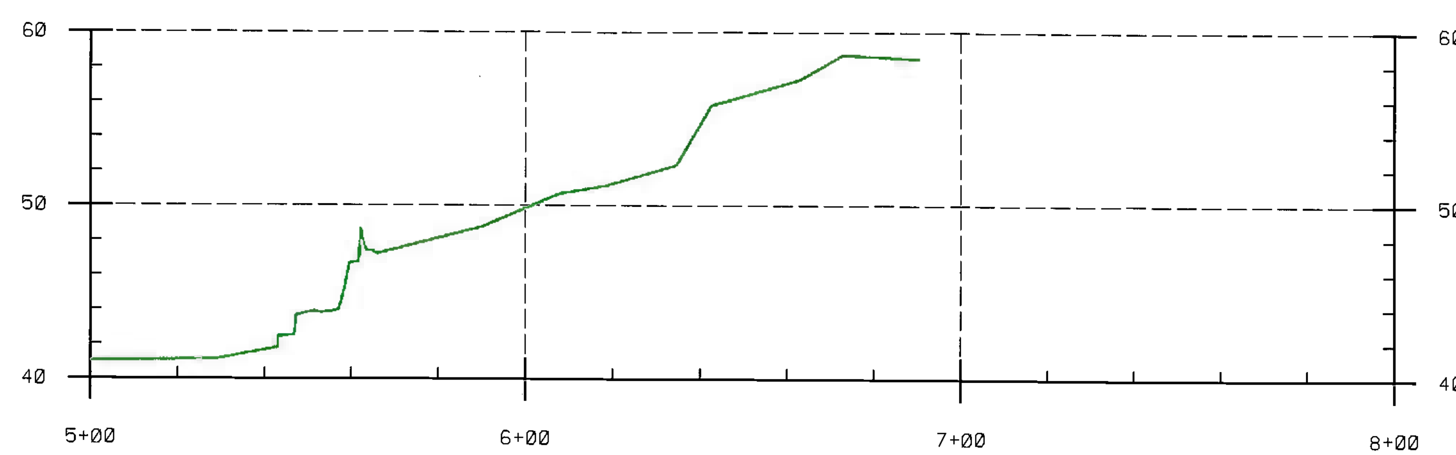
TAX MAP
POSITION SHEET

SHEET
NO.____
OF ____

J.D.____
FILES____



PROFILE OF CONSTRUCTION BASELINE BASED ON DIGITAL TERRAIN MODEL



PROFILE OF THALWEG BASED ON YEAR ONE FIELD SURVEY

LEGEND

- AS-BUILT GRADE
- ORIGINAL EXISTING GROUND
- DESIGN GRADE

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE	REVISION	BY

DRAWING COMPLETED

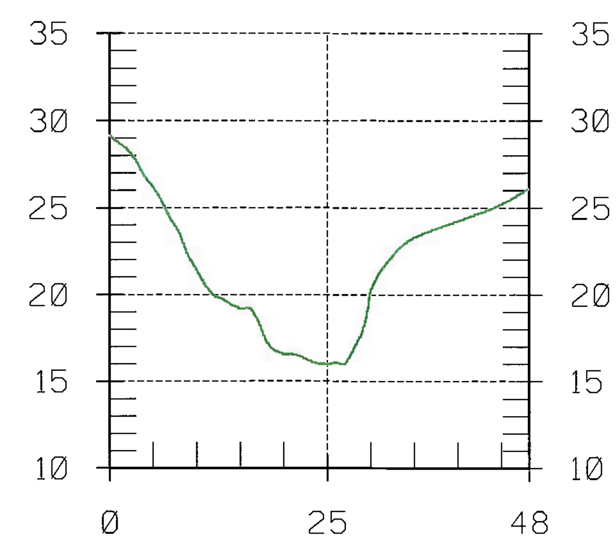
HARFORD COUNTY MARYLAND	HARFORD COUNTY DIRECTOR OF PUBLIC WORKS Date	HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING Date	DEPARTMENT OF PUBLIC WORKS WATER RESOURCES ENGINEERING	FOSTER BRANCH TRIBUTARY BASELINE POST - CONSTRUCTION PROFILE

KCI TECHNOLOGIES Engineers Planners Scientists Construction Managers 10 North Park Drive Hunt Valley, MD 21030 Phone (410) 316-7800 Fax (410) 316-7817 www.kci.com

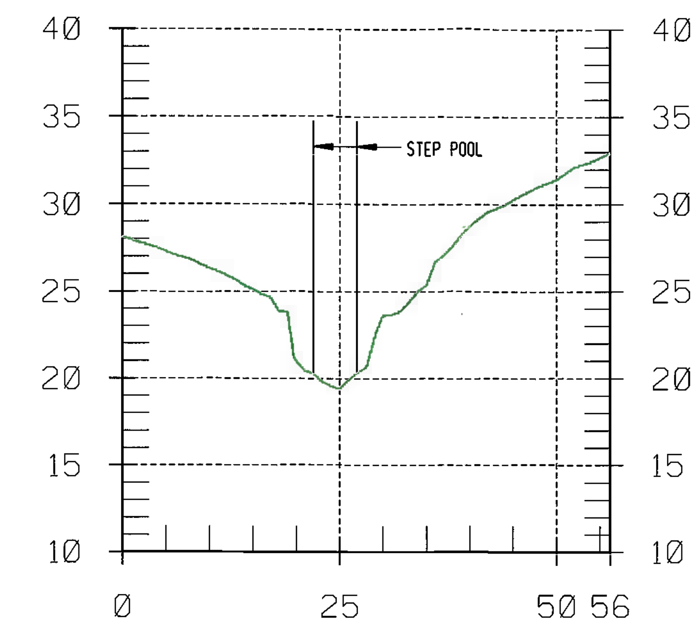
DESIGNED	SCALE NTS APPROX. SCALE HOR. 1"=40' VERT. 1"=10'	TAX MAP	SHEET	J.O.
TRACED		POSITION SHEET	NO.	FILES
CHECKED			OF	

APPENDIX D

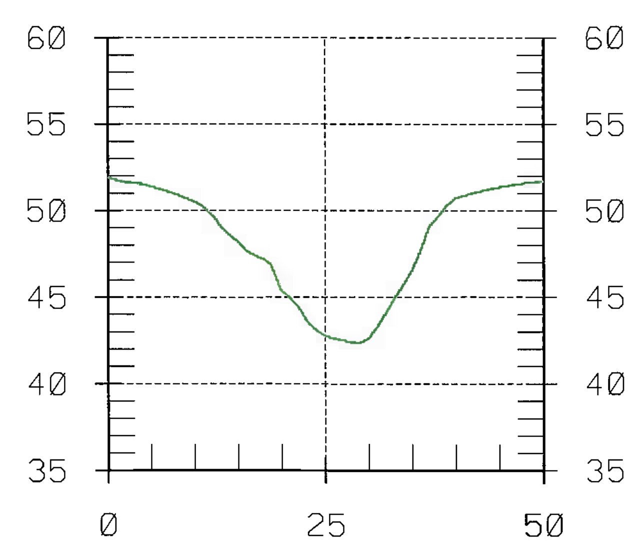
CROSS-SECTIONAL SURVEY DATA



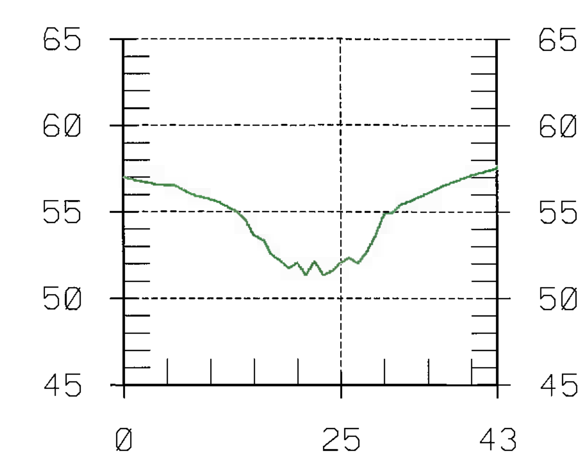
SECTION 1-1



SECTION 2-2



SECTION 3-3



SECTION 4-4

LEGEND

AS-BUILT GRADE

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE	REVISION	BY

DRAWING COMPLETED

HARFORD COUNTY MARYLAND

HARFORD COUNTY DIRECTOR OF PUBLIC WORKS

Date

HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING

Date

DEPARTMENT OF PUBLIC WORKS WATER RESOURCES ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE

POST - CONSTRUCTION CROSS SECTIONS

KCI TECHNOLOGIES

Engineers Planners Scientists Construction Managers

10 North Park Drive Hunt Valley, MD 21030 Phone:(410) 316-7800 Fax:(410) 316-7817 www.kci.com

DESIGNED

TRACED

CHECKED

SCALE APPROX. SCALE HOR. 1"= 20' VERT. 1"= 10'

TAX MAP

POSITION SHEET

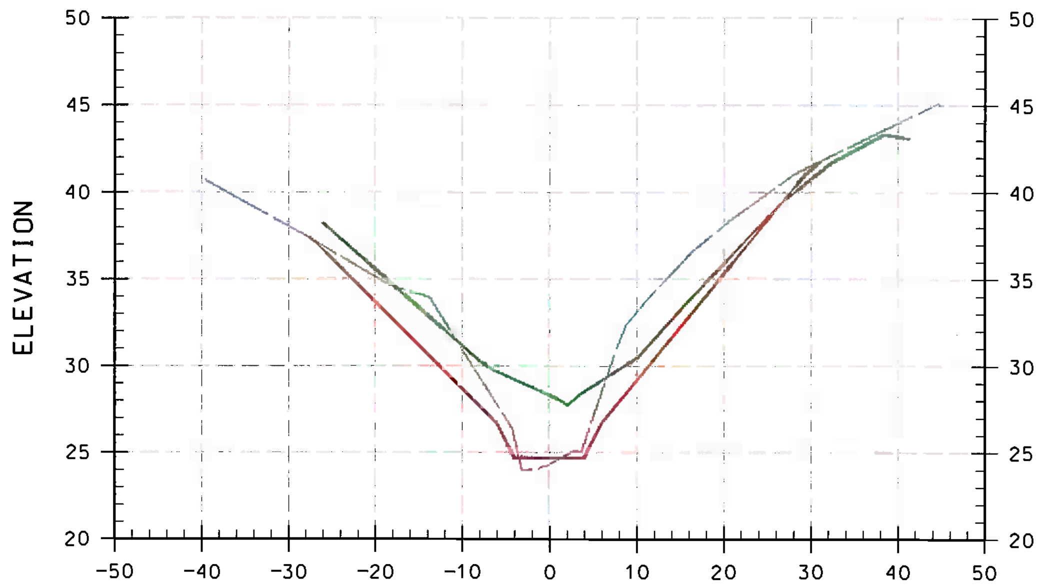
SHEET

NO.

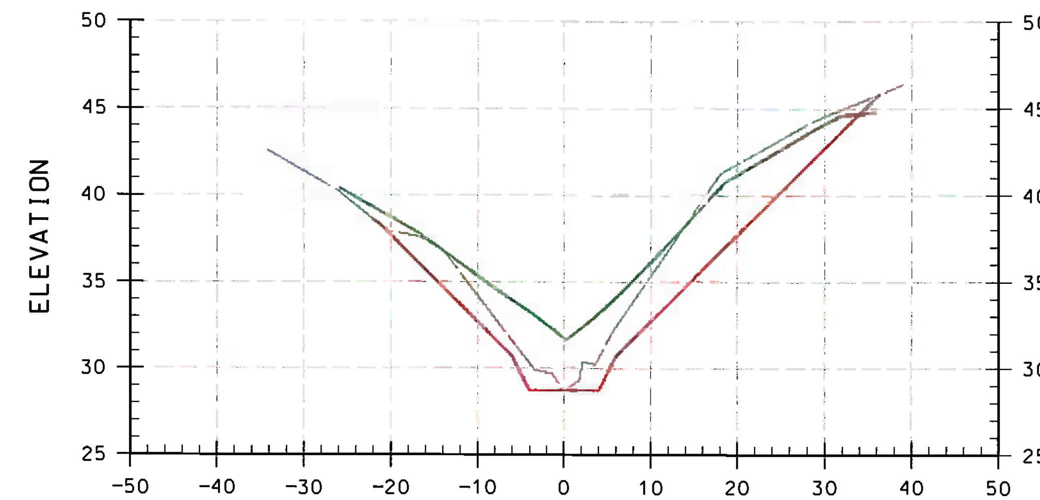
OF

J.O.

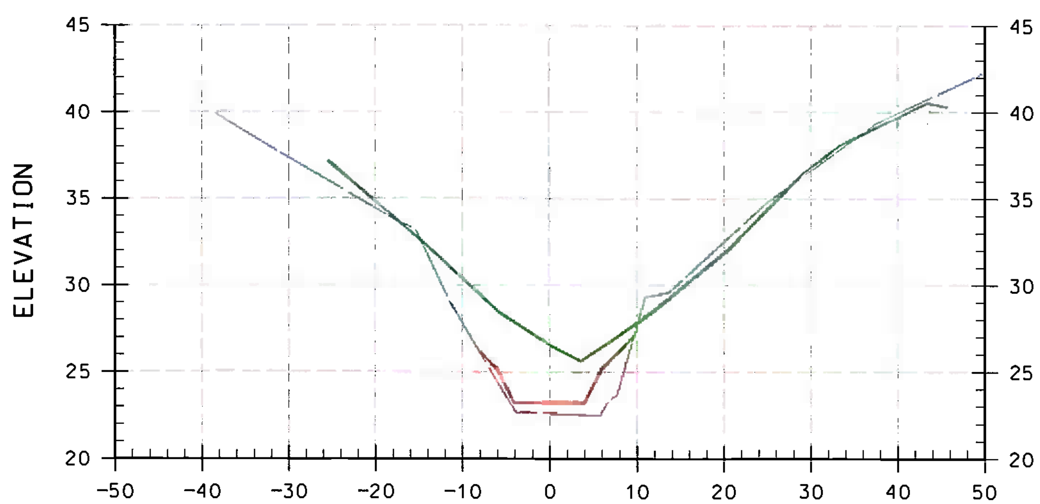
FILES



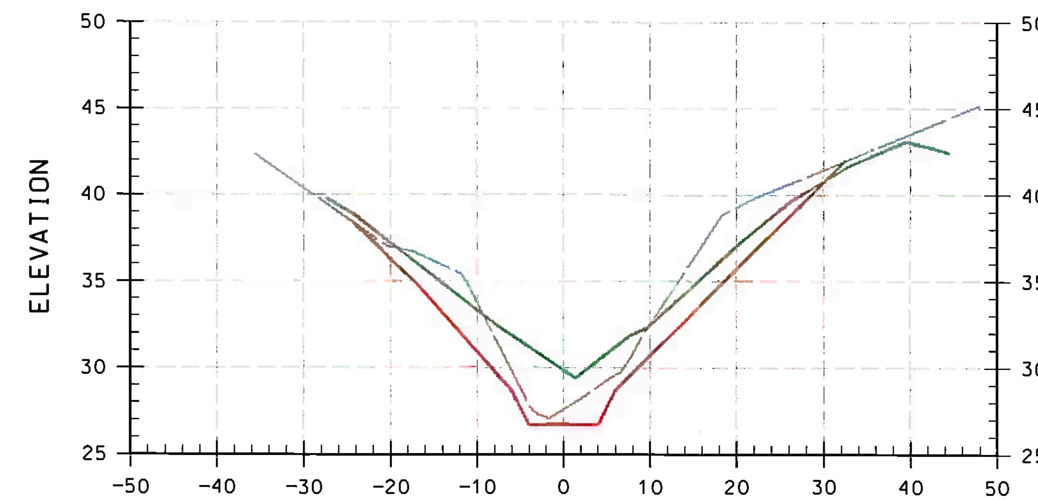
3+35



3+85



3+10



3+60

CROSS-SECTIONS ALONG DESIGN BASELINE

LEGEND

- AS-BUILT GRADE
- ORIGINAL EXISTING GROUND
- DESIGN GRADE

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE | REVISION | BY

DRAWING COMPLETED

HARFORD COUNTY MARYLAND

HARFORD COUNTY DIRECTOR OF PUBLIC WORKS ________ Date

HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING ________ Date

DEPARTMENT OF PUBLIC WORKS WATER RESOURCES ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE
POST - CONSTRUCTION CROSS SECTION /
DESIGN CROSS SECTION COMPARISON

KCI TECHNOLOGIES

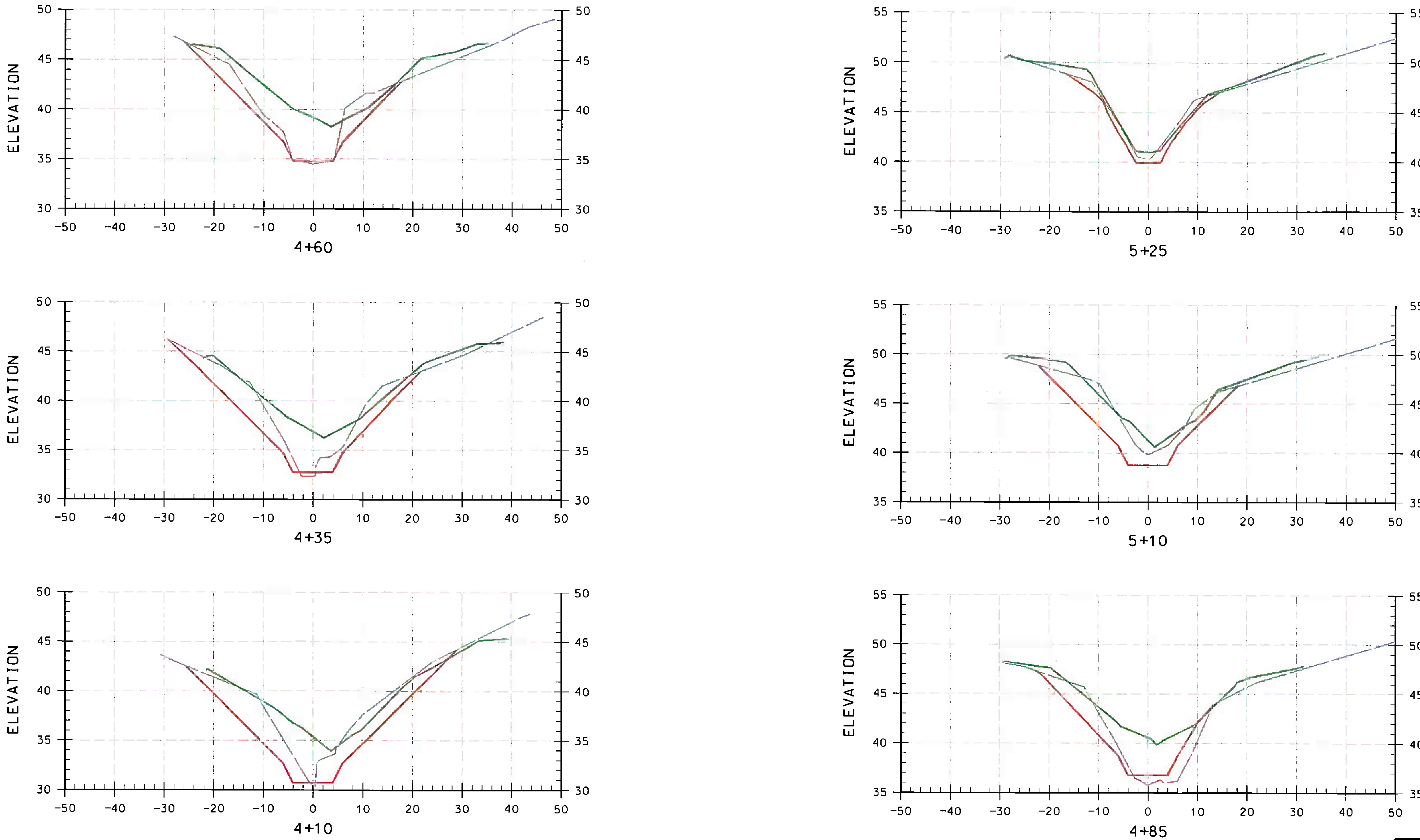
DESIGNED
TRACED
CHECKED

SCALE APPROX. SCALE HOR. 1"= 20' VERT. 1"= 10'

TAX MAP | POSITION SHEET

SHEET NO. OF

J.O. FILES



CROSS-SECTIONS ALONG DESIGN BASELINE

LEGEND

- AS-BUILT GRADE
- ORIGINAL EXISTING GROUND
- DESIGN GRADE

ENGINEER'S SEAL

TRAFFIC/TRANS.	CH. W/S ENG.
SED. CONTROL	ASSESSMENTS
W/S CONST.	MAINT/OP
H-WAY CONST. PERMITS	DESIGN
LAND ACQUISITION	ENG. SYS. BR.

DATE	REVISION	BY

DRAWING COMPLETED

HARFORD COUNTY MARYLAND

HARFORD COUNTY DIRECTOR OF PUBLIC WORKS ____ Date ____

HARFORD COUNTY DEPUTY DIRECTOR, WATER RESOURCES ENGINEERING ____ Date ____

DEPARTMENT OF PUBLIC WORKS
WATER RESOURCES
ENGINEERING

FOSTER BRANCH TRIBUTARY BASELINE
POST – CONSTRUCTION CROSS SECTION /
DESIGN CROSS SECTION COMPARISON

KCI TECHNOLOGIES — Engineers, Planners, Scientists, Construction Managers — 10 North Park Drive, Hunt Valley, MD 21030, Phone (410) 316-7800, Fax (410) 316-7817, www.kci.com

DESIGNED
TRACED
CHECKED

SCALE: APPROX. SCALE HOR. 1"= 20' VERT. 1"= 10'

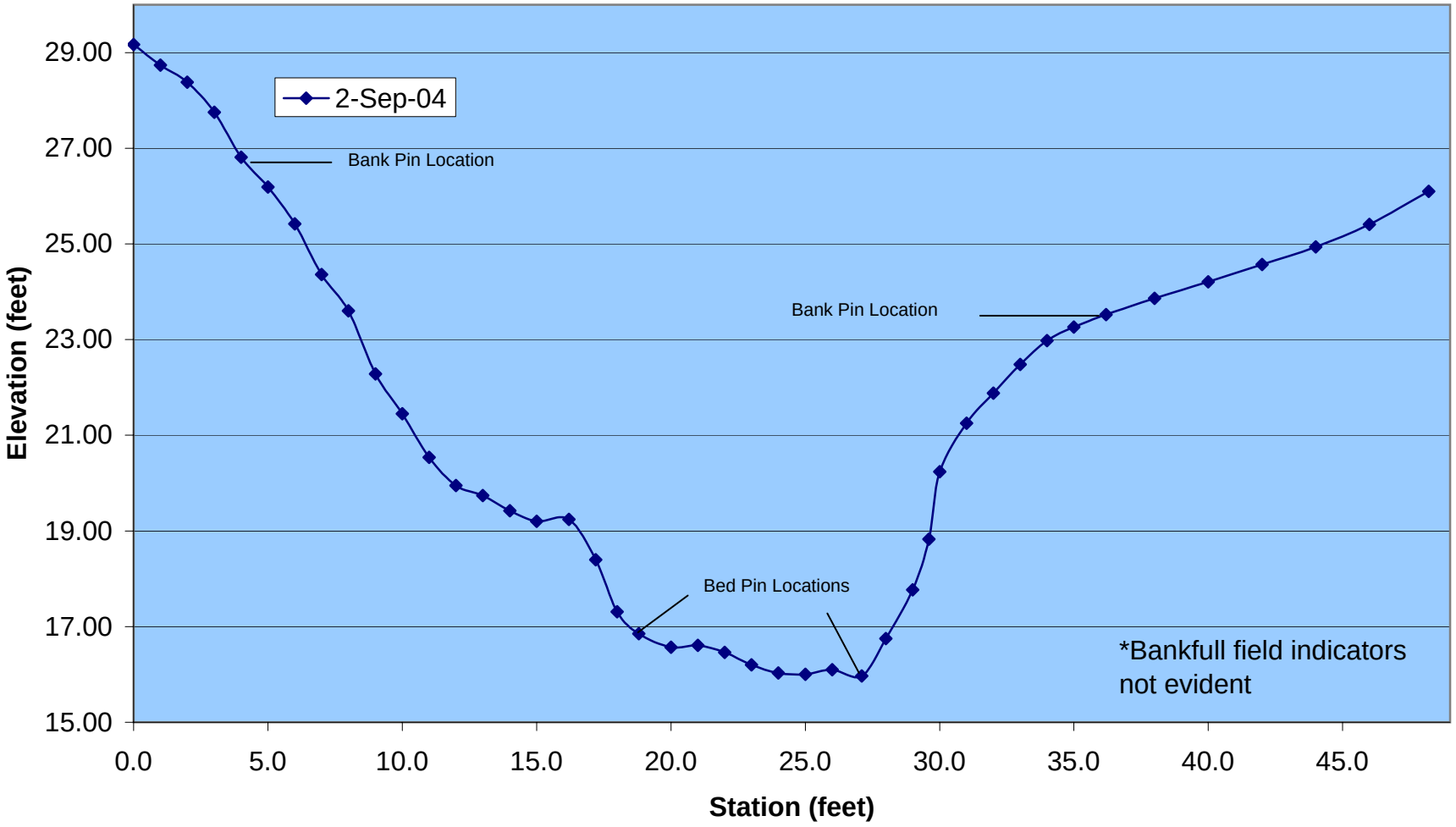
TAX MAP / POSITION SHEET

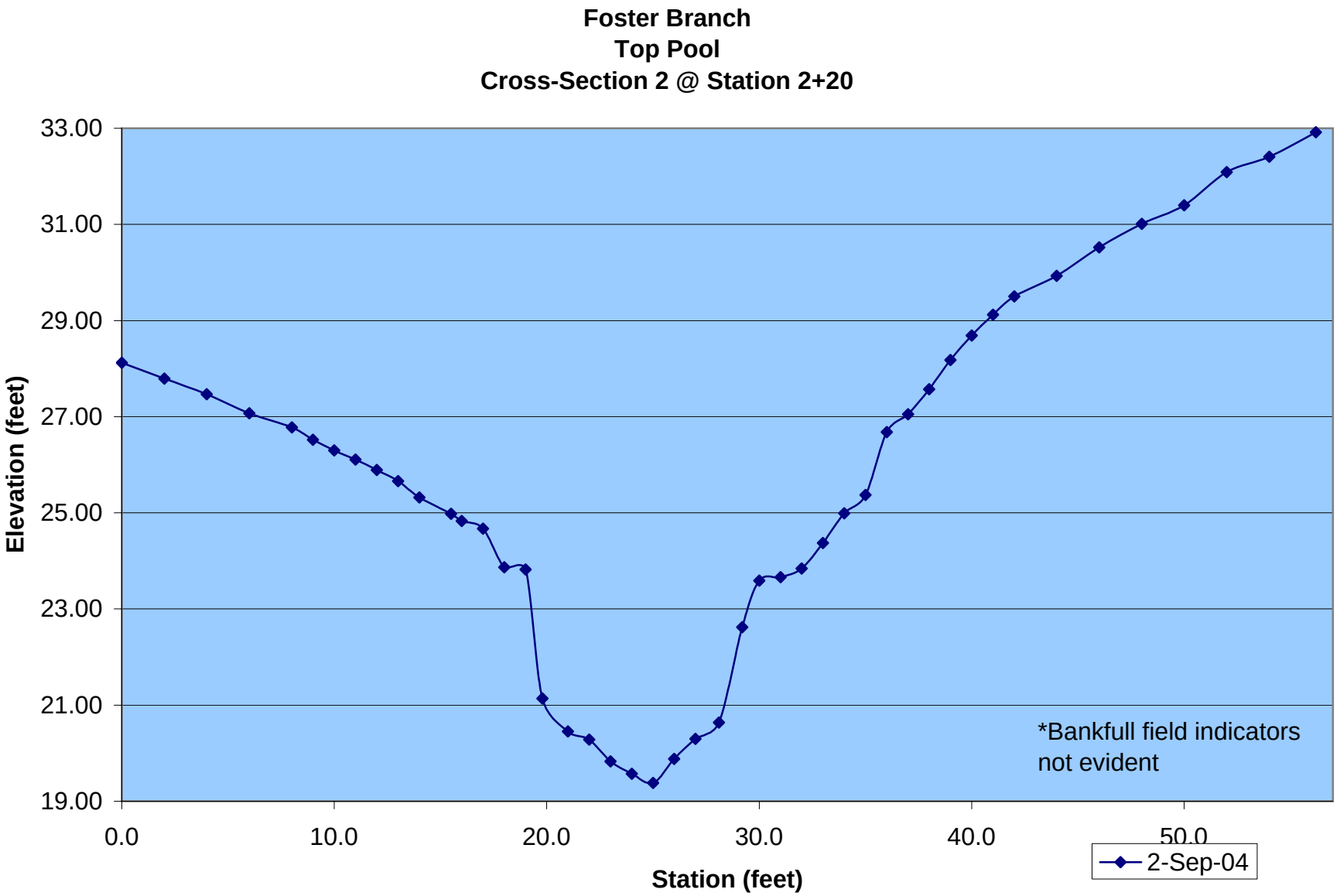
SHEET NO. ____ OF ____

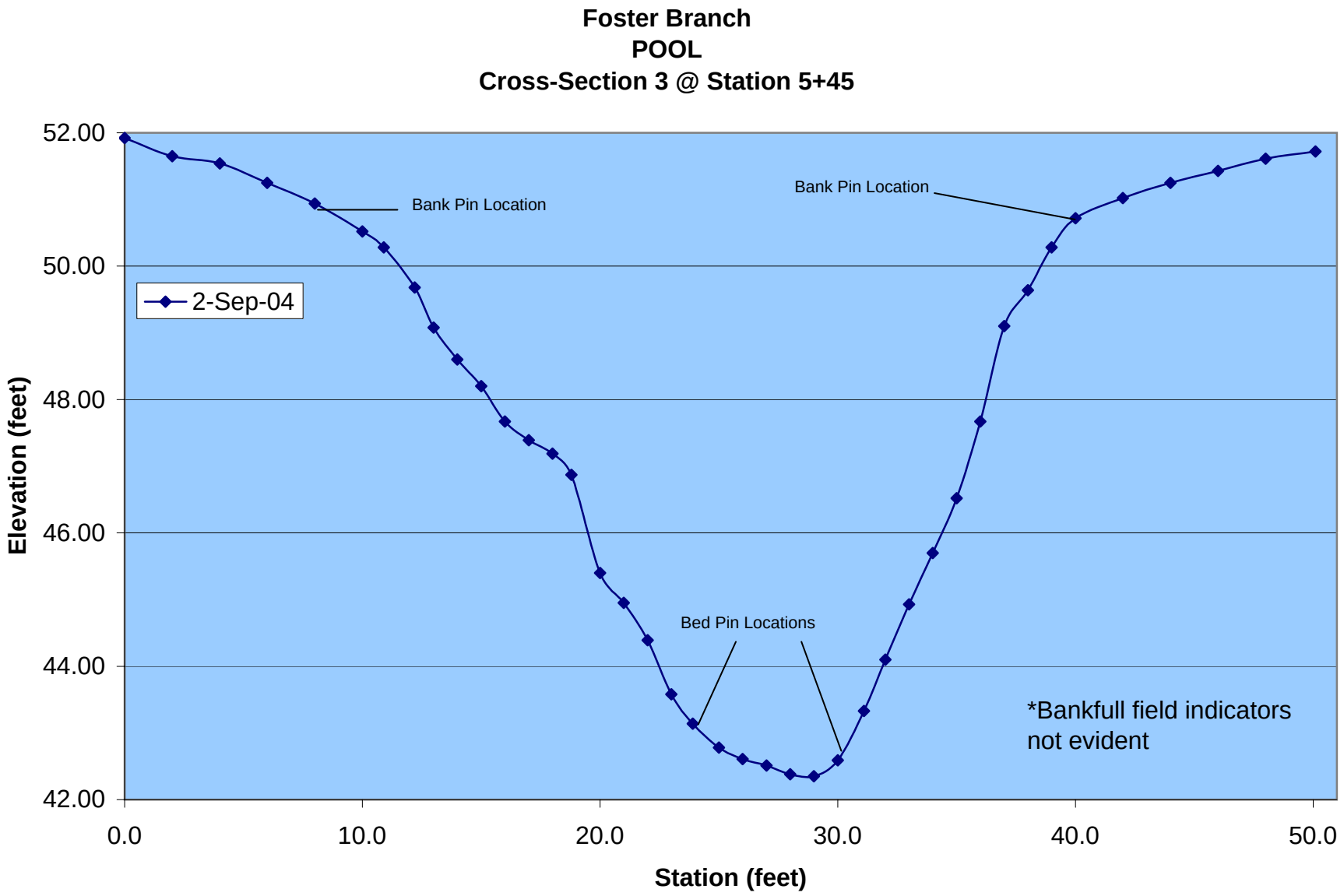
J.O. ____

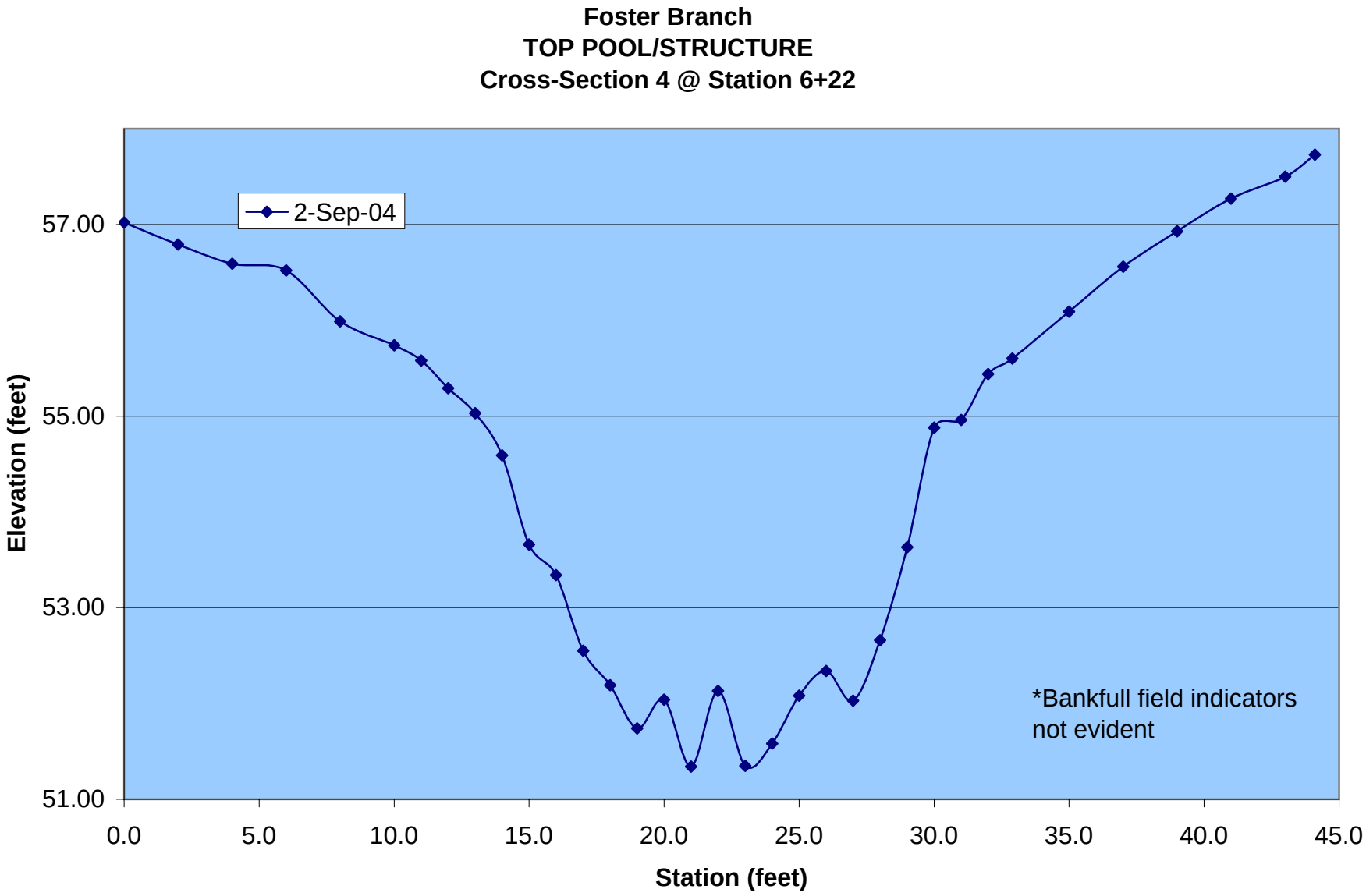
FILES ____

Foster Branch
Riffle
Cross-Section 1 @ Station 1+50



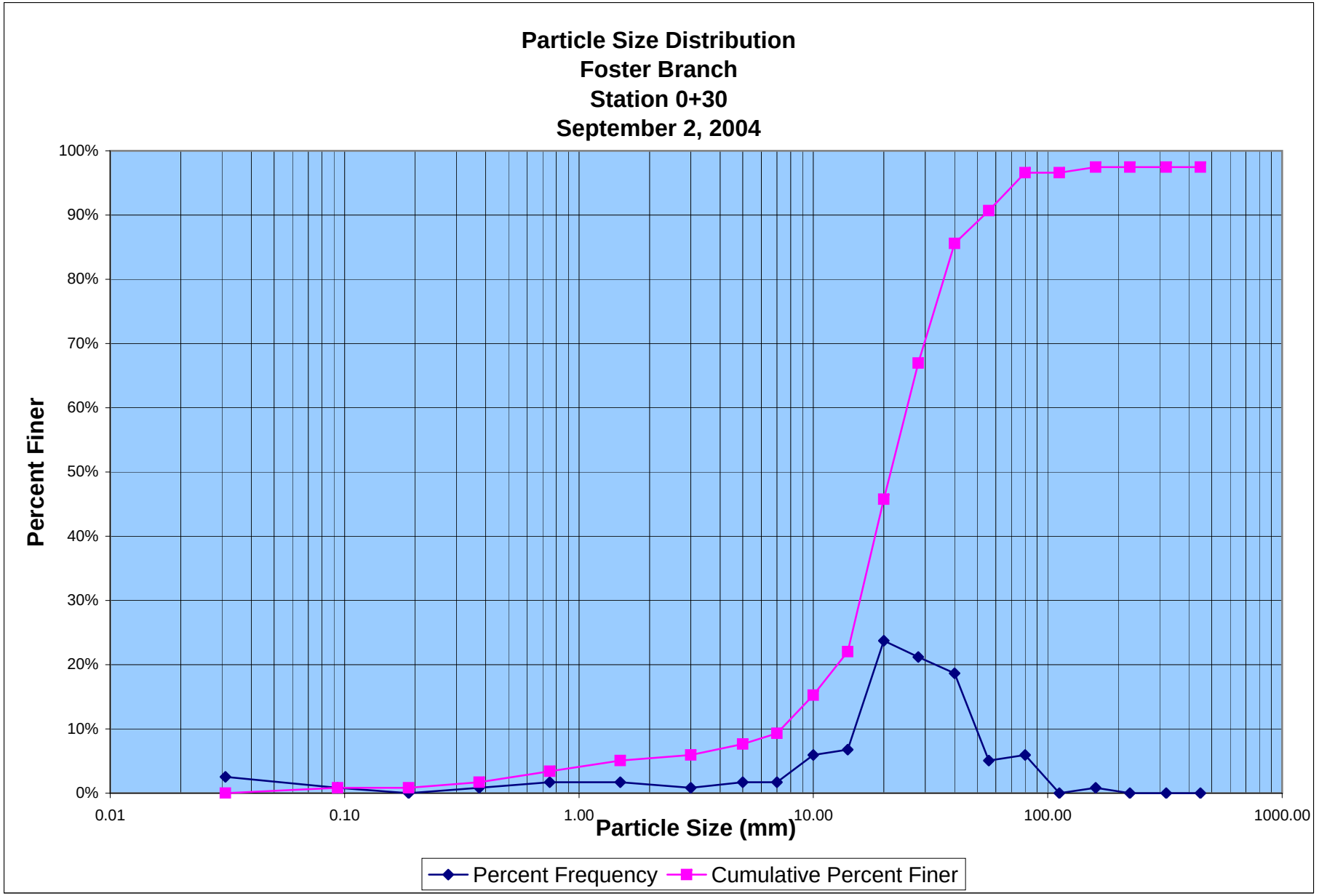

Foster Branch
Top Pool
Cross-Section 2 @ Station 2+20
33.00
31.00
29.00
27.00
25.00
23.00
21.00
19.00
Elevation (feet)
0.0
10.0
20.0
30.0
40.0
50.0
Station (feet)
*Bankfull field indicators not evident
2-Sep-04

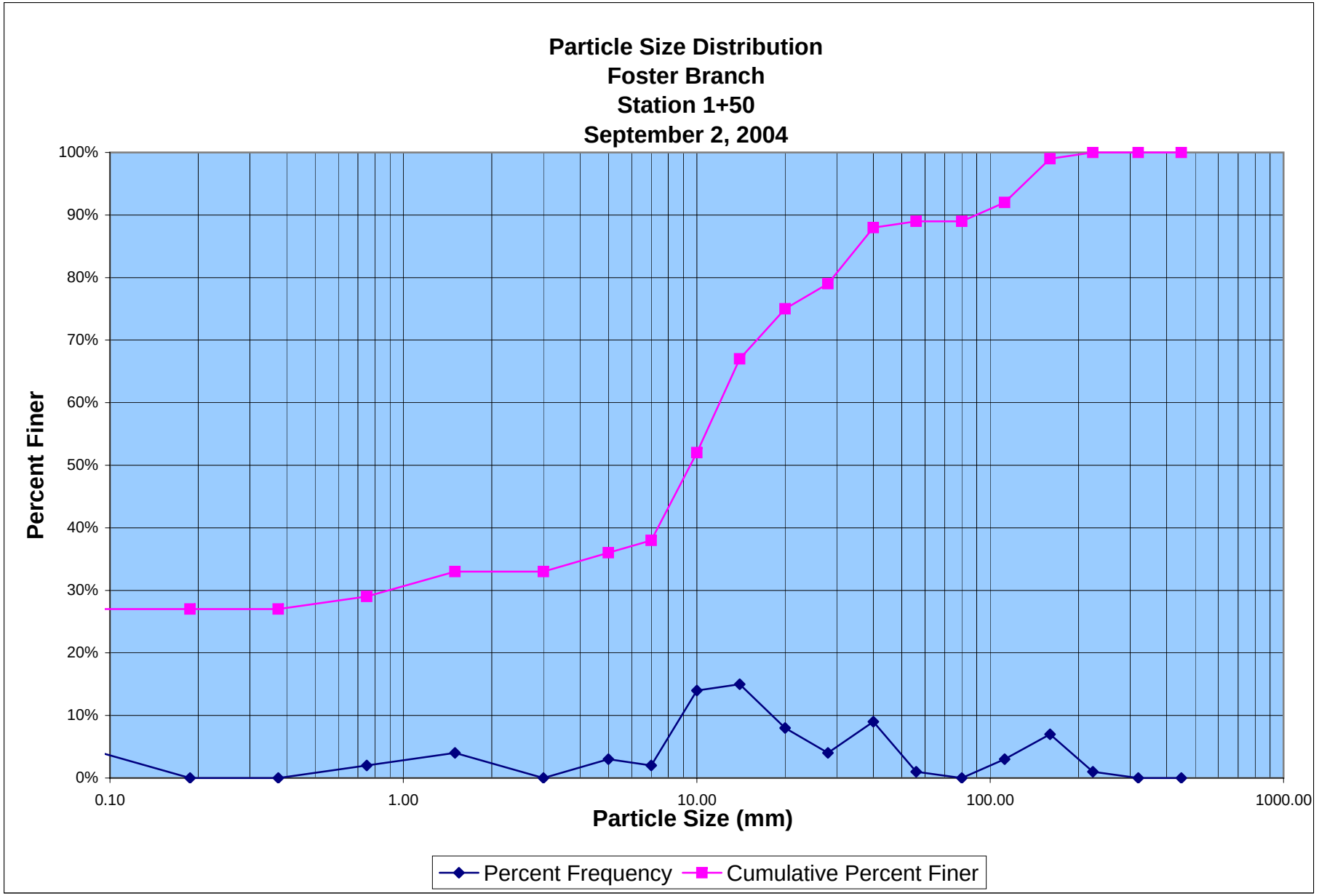

Foster Branch
POOL
Cross-Section 3 @ Station 5+45
52.00
50.00
48.00
46.00
44.00
42.00
Elevation (feet)
0.0
10.0
20.0
30.0
40.0
50.0
Station (feet)
2-Sep-04
Bank Pin Location
Bank Pin Location
Bed Pin Locations
*Bankfull field indicators
not evident

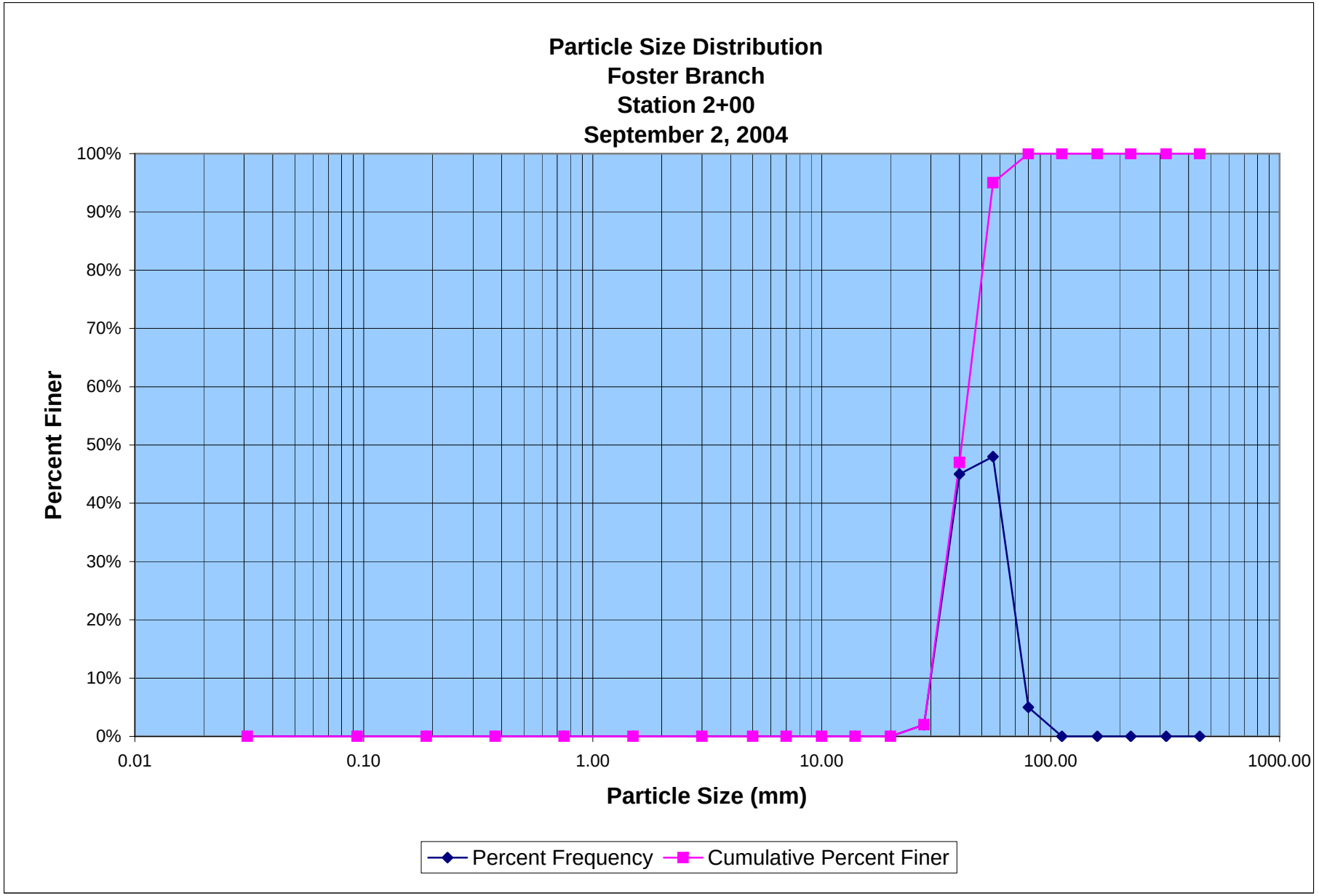

Foster Branch
TOP POOL/STRUCTURE
Cross-Section 4 @ Station 6+22
2-Sep-04
57.00
55.00
53.00
51.00
Elevation (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
Station (feet)
*Bankfull field indicators
not evident

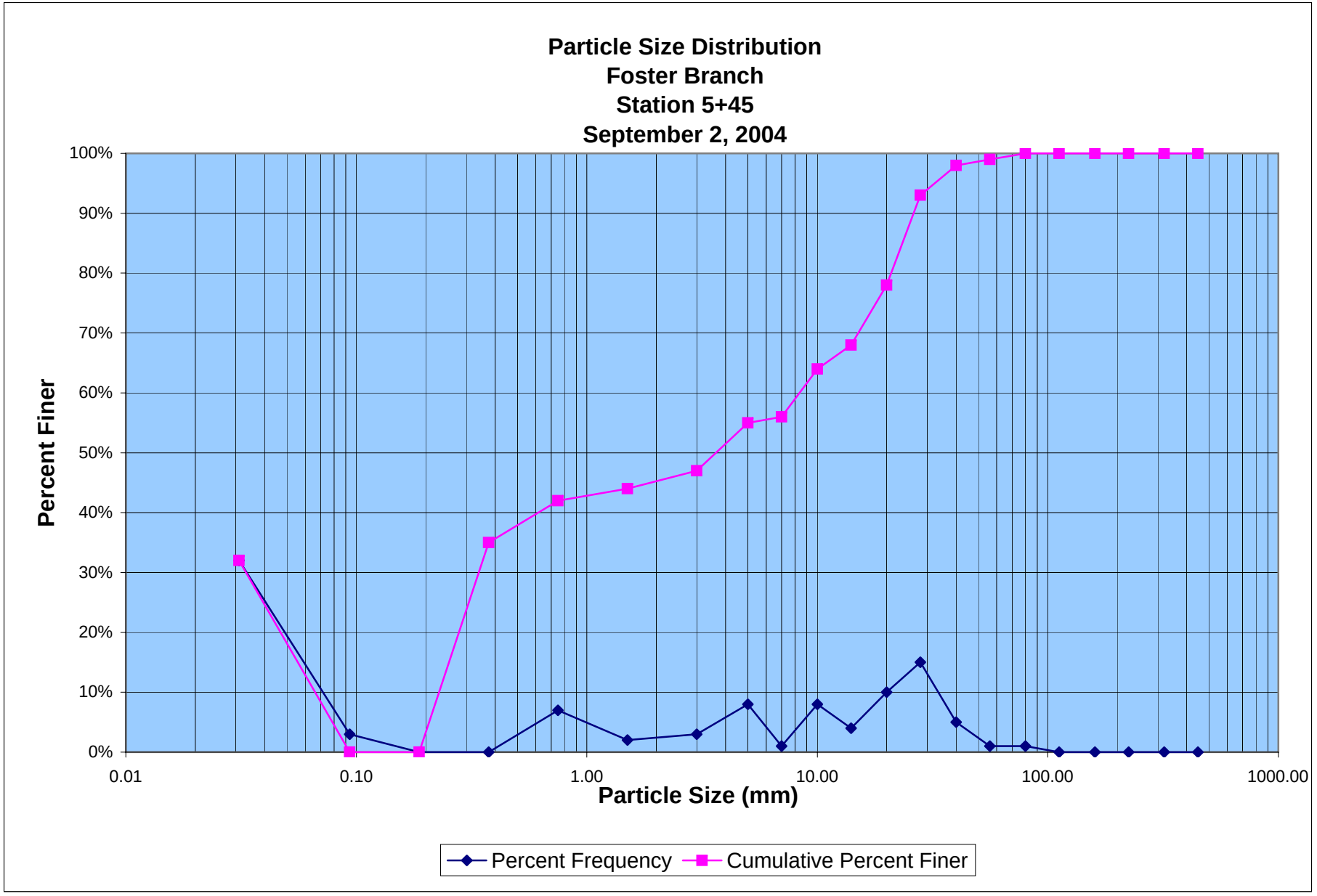
APPENDIX E

PEBBLE COUNT DATA


Particle Size Distribution
Foster Branch
Station 0+30
September 2, 2004
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.10
1.00
10.00
100.00
1000.00
Particle Size (mm)
Percent Frequency
Cumulative Percent Finer


Particle Size Distribution
Foster Branch
Station 1+50
September 2, 2004
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.10
1.00
10.00
100.00
1000.00
Particle Size (mm)
Percent Frequency
Cumulative Percent Finer


Particle Size Distribution
Foster Branch
Station 2+00
September 2, 2004
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.10
1.00
10.00
100.00
1000.00
Particle Size (mm)
Percent Frequency
Cumulative Percent Finer


Particle Size Distribution
Foster Branch
Station 5+45
September 2, 2004
Percent Finer
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.10
1.00
10.00
100.00
1000.00
Particle Size (mm)
Percent Frequency
Cumulative Percent Finer

APPENDIX F

MDE PERMIT

Foster Branch - Haverhill Tributary

STATE OF MARYLAND
DEPARTMENT OF THE ENVIRONMENT
WATER MANAGEMENT ADMINISTRATION

LETTER OF AUTHORIZATION

AUTHORIZATION NUMBER: 01-NT-0081/200162506

EFFECTIVE DATE: October 15, 2002

EXPIRATION DATE: October 15, 2005

AUTHORIZED PERSON: Harford County Government
Department of Public Works
212 South Bond Street
Bel Air, Maryland 21014

Attn: Ms. Elizabeth Weisengoff

IN ACCORDANCE WITH ENVIRONMENT ARTICLE §5-503(a) AND §5-906(a), ANNOTATED CODE OF MARYLAND (1996 REPLACEMENT VOLUME), COMAR 26.17.04 AND 26.23.01, AND THE ATTACHED PERMIT CONDITIONS OF AUTHORIZATION, Harford County Government, ("AUTHORIZED PERSON"), IS HEREBY AUTHORIZED BY THE WATER MANAGEMENT ADMINISTRATION ("ADMINISTRATION") TO CONDUCT A REGULATED ACTIVITY IN A NONTIDAL WETLAND, BUFFER, OR EXPANDED BUFFER, AND/OR TO CHANGE THE COURSE, CURRENT OR CROSS-SECTION OF WATERS OF THE STATE, IN ACCORDANCE WITH THE ATTACHED PLANS APPROVED BY THE WATER MANAGEMENT ADMINISTRATION, NONTIDAL WETLANDS AND WATERWAYS DIVISION ON October 15, 2002, ("APPROVED PLAN") AND PREPARED BY KCI Technologies, Inc. AND INCORPORATED HEREIN, AS DESCRIBED BELOW:

Stabilization of the stream banks and bed of Foster Branch. Authorized activities include the construction of step pools, a boulder cascade, and the regrading and revegitation of banks. The project is located on the east side of Foster Knoll Drive approximately 500 feet south of the intersection of Foster Knoll Drive and Trimble Road, in Harford County, Maryland. The proposed project will impact approximately 365 linear feet of Foster Branch however, will not affect any nontidal wetlands or wetland buffers.

MD Grid Coordinates: 574309± N; 985954± E

For Amanda L. Sigillito, Chief
Nontidal Wetlands & Waterways Division

Attachments: Conditions of Authorization
U.S. Army Corps of Engineers Authorization (MDSPGP) w/ plans

cc: U.S. Army Corps of Engineers (David Olson)
Compliance Program w/ file
KCI Technologies, Inc., Mark Richmond

THE FOLLOWING CONDITIONS OF AUTHORIZATION APPLY TO ALL ACTIVITIES AUTHORIZED BY AUTHORIZATION NO. 01-NT-0081/200162506:

GENERAL CONDITIONS

1. Validity: Authorization is valid only for use by Authorized Person. Authorization may be transferred only with prior written approval of the Administration. In the event of transfer, transferee agrees to comply with all terms and conditions of Authorization.

2. Initiation of Work, Modifications, and Extension of Term: Authorized Person shall initiate authorized activities within two (2) years of the Effective Date of this Authorization or the Authorization shall expire. Authorized Person may submit written requests to the Administration for (a) extension of the period for initiation of work, (b) modification of Authorization, including the Approved Plan, or, (c) not later than 45 days prior to Expiration Date, an extension of the term. Requests for modification shall be in accordance with applicable regulations and shall state reasons for changes, and shall indicate the impacts on nontidal wetlands, streams, and the floodplain, as applicable. The Administration may grant a request at its sole discretion.

3. Responsibility and Compliance: Authorized Person is fully responsible for all work performed and activities authorized by this Authorization shall be performed in compliance with this Authorization and Approved Plan. Authorized Person agrees that a copy of the Authorization and Approved Plan shall be kept at the construction site and provided to its employees, agents and contractors. A person (including Authorized Person, its employees, agents or contractors) who violates or fails to comply with the terms and conditions of this Authorization, Approved Plan or an administrative order may be subject to penalties in accordance with §5-514 and §5-911, Environment Article, Annotated Code of Maryland (1996 Replacement Volume).

4. Failure to Comply: If Authorized Person, its employees, agents or contractors fail to comply with this Authorization or Approved Plan, the Administration may, in its discretion, issue an administrative order requiring Authorized Person, its employees, agents and contractors to cease and desist any activities which violate this Authorization, or the Administration may take any other enforcement action available to it by law, including filing civil or criminal charges.

5. Suspension or Revocation: Authorization may be suspended or revoked by the Administration, after notice of opportunity for a hearing, if Authorized Person: (a) submits false or inaccurate information in Permit application or subsequently required submittals; (b) deviates from the Approved Plan, specifications, terms and conditions; (c) violates, or is about to violate terms and conditions of this Authorization; (d) violates, or is about to violate, any regulation promulgated pursuant to Title 5, Environment Article, Annotated Code of Maryland as amended; (e) fails to allow authorized representatives of the Administration to enter the site of authorized activities at any reasonable time to conduct inspections and evaluations; (f) fails to comply with the requirements of an administrative action or order issued by the Administration; or (g) does not have vested rights under this Authorization and new information, changes in site conditions, or amended regulatory requirements necessitate revocation or suspension.

6. Other Approvals: Authorization does not authorize any injury to private property, any invasion of rights, or any infringement of federal, State or local laws or regulations, nor does it obviate the need to obtain required authorizations or approvals from other State, federal or local agencies as required by law.

7. Site Access: Authorized Person shall allow authorized representatives of the Administration access to the site of authorized activities during normal business hours to conduct inspections and evaluations necessary to assure compliance with this Authorization. Authorized Person shall provide necessary assistance to effectively and safely conduct such inspections and evaluations.

8. Inspection Notification: Authorized Person shall notify the Administration's Compliance Program at least five (5) days before starting authorized activities and five (5) days after completion. For Frederick, Washington, Allegany and Garrett counties, Authorized Person shall call (301) 689-8494. For all other counties, call the Baltimore office at (410) 631-3510.

9. Sediment Control: Authorized Person shall obtain approval from the Harford Soil Conservation District (if required) for a grading and sediment control plan specifying soil erosion control measures. The approved grading and sediment control plan shall be included in the Approved Plan, and shall be available at the construction site.

10. Federally Mandated State Authorizations:
__X__ Water Quality Certification: Water Quality Certification is granted for this project provided that all work is performed in accordance with the authorized project description and associated conditions.
__X__ Coastal Zone Consistency: This Authorization constitutes official notification that authorized activities are consistent with the Maryland Coastal Zone Management Program, as required by Section 307 of the Federal Coastal Zone Management Act of 1972, as amended. Activities within the following counties are not subject to this requirement: Allegany, Carroll, Frederick, Garrett, Howard, Montgomery, and Washington.

11. Best Management Practices During Construction: Authorized Person, its employees, agents and contractors shall conduct authorized activities in a manner consistent with the Best Management Practices specified by the Administration.

12. Disposal of Excess: Unless otherwise shown on the Approved Plan, all excess fill, spoil material, debris, and construction material shall be disposed of outside of nontidal wetlands, nontidal wetlands buffers, and the 100-year floodplain, and in a location and manner which does not adversely impact surface or subsurface water flow into or out of nontidal wetlands.

13. Temporary Staging Areas: Temporary construction trailers or structures, staging areas and stockpiles shall not be located within nontidal wetlands, nontidal wetlands buffers, or the 100-year floodplain unless specifically included on the Approved Plan.

14. Temporary Stream Access Crossings: Temporary stream access crossings shall not be constructed or utilized unless shown on the Approved Plan. If temporary stream access crossings are determined necessary prior to initiation of work or at any time during construction, Authorized Person, its employees, agents or contractors shall submit a written request to the Administration and secure the necessary permits or approvals for such crossings before installation of the crossings. Temporary stream access crossings shall be removed and the disturbance stabilized prior to completion of authorized activity or within one (1) year of installation.

15. Discharge: Runoff or accumulated water containing sediment or other suspended materials shall not be discharged into waters of the State unless treated by an approved sediment control device or structure.

16. Instream Construction Prohibition: To protect important aquatic species, activities within stream channels are prohibited as determined by the classification of the stream (COMAR 26.08.02.08):
Foster Branch is a Use I Waterways: Instream work may not be conducted from, March 1 through June 15 inclusive, of any year.

17. Instream Blasting: Authorized Person shall obtain prior written approval from the Administration before blasting or using explosives in the stream channel.

18. Minimum Disturbance: Any disturbance of stream banks, channel bottom, wetlands, and wetlands buffer authorized by Permit or Approved Plan shall be the minimum necessary to conduct permitted activities. All disturbed areas shall be stabilized vegetatively no later than seven (7) days after construction is completed or in accordance with the approved grading or sediment and erosion control plan.

19. Restoration of Construction Site: Authorized Person shall restore the construction site upon completion of authorized activities. Undercutting, meandering or degradation of the stream banks or channel bottom, any deposition of sediment or other materials, and any alteration of wetland vegetation, soils, or hydrology, resulting directly or indirectly from construction or authorized activities, shall be corrected by Authorized Person as directed by the Administration.

AUTHORIZATION NO. 01-NT-0081/200162506

20. The permitee shall monitor the stream restoration project for a minimum of three (3) years following the completion of construction of the project. The monitoring shall identify and evaluate changes in channel cross-section; pattern and profile; bed materials; channel stability; structure stability and condition; and vegetation viability. The monitoring effort shall include topographic surveys of monumented cross-sections within the realigned channel segment, visual field observations, photographic documentation, vegetation viability measurements, and identify any necessary corrective measures.

21. The permittee shall submit annual reports on the results of the monitoring efforts at the stream restoration project to the Department by the anniversary date of the completion of construction. The permittee and shall coordinate with the regulatory agencies concerning applicable remedial measures for any identified project failures and shall correct any project failures within one year of their identification.

U.S. ARMY CORPS OF ENGINEERS AUTHORIZATION

The project is authorized by the U.S. Army Corps of Engineers under the Maryland State Programmatic General Permit, Category IIIA, Activity 17, subject to the attached General Conditions of the MDSPGP.